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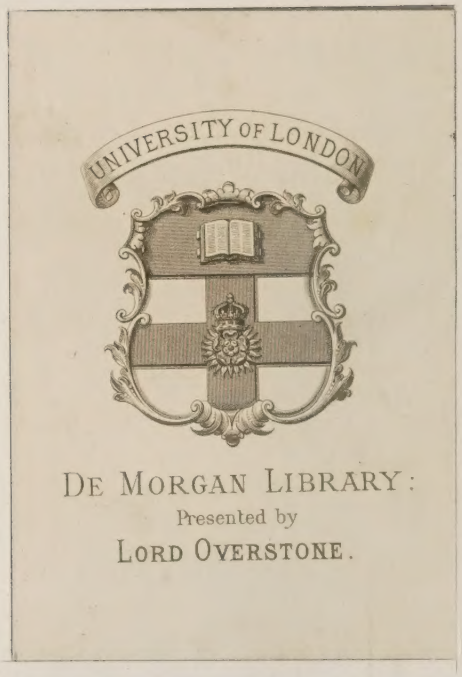
GREENWICH PARK.



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I 16 [Greenwich Park] fol. Reference only.

[Only item 3 is in the Hand Catalogue, under "Parliamentary Papers" (page 237), but all four items are in the Card Catalogue.]

Various documents ordered to be printed by the House of Commons on the projected railroad through Greenwich park

Mr Airy's letter to Sir Robert Inglis in the Athenæum

Sir James South's announcement of intention to reply.

Athenæum information that it could not publish a so called reply de omnibus &c

The Parliamentary items have been noted in the official printed index.

Wmlf. Nov '47.

GREENWICH PARK.

RETURN to an ADDRESS of the Honourable The House of Commons, dated 25 May 1846;—*for*,

"COPIES of the CORRESPONDENCE with the COMMISSIONERS of HER MAJESTY'S WOODS AND FORESTS respecting the passing of a Railroad through *Greenwich Park*."

Office of Woods, &c.
10 June 1846.

CANNING,
A. MILNE,
CHARLES GORE,
} Commissioners of Her Majesty's Woods, Forests, Land Revenues, Works, and Buildings.

Ordered, by The House of Commons, *to be Printed*, 16 *June* 1846.

COPIES of the CORRESPONDENCE with the COMMISSIONERS of HER MAJESTY'S WOODS and FORESTS respecting the passing of a Railroad through *Greenwich Park*.

— (A.) —

Sir, Greenwich Hospital, 6 March 1846.

I AM directed by the Commissioners [illegible]casions; [illegible]nwich Hospital to request you will be pleased to call the attention [illegible]ailway thr[illegible]mmissioners of Her Majesty's Woods and Forests to a Bill now be [illegible]ament, "to enable the South Eastern Railway Company to make a R[illegible]emori[illegible]rom the London and Greenwich Railway, to join the South Eastern, Canterbury, Ramsgate, and Margate Railway, in the Parish of Chilham, in the County of Kent, forming an Alternative Loop to pass through Greenwich Park."

The line of this alternative loop passing so immediately in the vicinity of the Hospital's buildings is considered by the Commissioners of the Hospital to be exceedingly objectionable in many respects, and they are therefore desirous of giving it all the opposition in their power; and they beg that the Commissioners of Her Majesty's Woods and Forests, before giving any assent to the proposed measure, will be so obliging as to communicate their intention to the Commissioners of the Hospital.

I am, &c.

T. W. Philipps, Esq.
&c. &c. &c.

(signed) *John A. Lethbridge*,
Secretary.

— (B.) —

Sir, Office of Woods, &c. 11 March 1846.

I HAVE, on behalf of the Commissioners of Her Majesty's Woods, &c., to acknowledge the receipt of your letter, dated the 6th instant, requesting, on behalf of the Commissioners of Greenwich Hospital, the attention of this Board to a Bill before Parliament, to enable the South Eastern Railway Company to make a railway from the London and Greenwich Railway, to join their Canterbury, Ramsgate, and Margate Railway, in the parish of Chilham, in the county of Kent, forming an alternative loop to pass through Greenwich Park, and stating that as this alternative loop would pass in the immediate vicinity of

the Hospital buildings, and is considered by the Commissioners to be very objectionable, they request that this Board would communicate with them before they give their assent to this measure; and I have, in reply, to request that you will furnish this Board with an explanation, in what manner, and to what extent, the Crown property in Greenwich Park will be affected by the proposed railway.

I am, &c.

J. A. Lethbridge, Esq. (signed) *A. Milne.*

— (C.) —

Sir, Greenwich Hospital, 12 March 1846.

AGREEABLY to the request of the Commissioners of Her Majesty's Woods, &c., contained in your letter of yesterday's date, to be furnished with an explanation, in what manner, and to what extent, the Crown property in Greenwich will be affected by the proposed railway through Greenwich Park,

I am directed by the Commissioners of Greenwich Hospital to inform you that authority is sought by the Bill to carry the proposed railway through the Royal Park, from east to west, in a tunnel, which, in the commencement of its construction, will be an open cutting, and prove a considerable nuisance to the public; and we are advised that the optional lines of deviation, namely, about 600 feet from north to south, are much too great.

With respect to the objectionable effect of this work on the property of the Hospital, it will intersect the pipes conveying the water through the Park from the conduits to the building, and also the large iron main laid down from the reservoir recently constructed for the supply of water in the event of fire, and the company reserve to themselves the power of taking any portion, or the whole of the buildings on Maize Hill.

Although it is intended to carry this railway in a tunnel, yet it is apprehended that the result must be much annoyance to the schools, from the constant recurrence of the noise attendant upon such undertakings.

I am, &c.

A. Milne, Esq. *Jno. A. Lethbridge*, Secretary.
&c. &c. &c.

(D *a.*)

Croom's Hill, Greenwich,

My Lord and Gentlemen, 20 March 1846.

I AM directed by the vicar, churchwardens, and other inhabitants of this parish, being a committee appointed at a public vestry meeting of the inhabitants, held on the 27th ultimo, to transmit to you the accompanying memorial, (D *b.*) and very respectfully to request your attention thereto.

I am, &c.

(signed) *E. W. James*, Vestry Clerk, &c.

To the Right Honourable and Honourable
The Commissioners of Her Majesty's Woods, Forests, &c.

— (D *b.*) —

TO the Right Honourable the Commissioners of Her Majesty's Woods, Forests, and Land Revenues.

The MEMORIAL of the Vicar, Churchwardens, and other Inhabitants of the Town and Parish of *Greenwich*, in the County of *Kent*, being a Committee appointed by the Parishioners assembled at a Public Vestry Meeting on Friday, the 27th day of February 1846,

Respectfully sheweth,

THAT your memorialists perceive that a Bill is now before the House of Commons, intituled, "A Bill to enable the South Eastern Railway Company to make a Railway from the London and Greenwich Railway, to join the South

South Eastern, Canterbury, Ramsgate and Margate Railway, in the Parish of Chilham, in the County of Kent," being No. 2, of the South Eastern Company's series of Bills now before the House.

That the said Company propose by such Bill to obtain power to carry their line from the present terminus of the London and Greenwich Railway at Greenwich, across five of the principal highways of that town, namely, Prince of Orange-lane, London-street, Royal Hill, Croom's Hill, and Maize Hill, and through the Royal Park, between Flamstead House and Greenwich Hospital.

That in so doing, the said Company propose to raise the carriage way of London-street five feet over an arch, and to pass under through a cutting 11 feet deep, and to proceed from thence by raising the ground of the highway called Royal Hill by a tunnel under the highways of Croom's Hill and Maize Hill, which said cuttings and tunnels will be productive of serious inconvenience to the owners and occupiers of houses adjoining such highways, and of passengers generally, and occasion great difficulty in the sewage and drainage of those parts of the town.

That the proposed line of railway through the Royal Park is open to the most serious objections, whether such line be carried through by means of a tunnel, cutting, embankment, or viaduct, which objections, as they must be obvious to your Honourable Board, and have been already urged on your attention in former memorials, it is not necessary here to repeat.

That as the South Eastern Railway Company propose by their said Bill to avail themselves of an alternative line, if the sanction of Her Majesty's Government should be refused to the crossing Greenwich Park, the said company would thereby still be enabled to continue their line of railway from London to Chilham, without defacing or injuring the town of Greenwich, or destroying the neighbourhood, and retirement of Greenwich Park.

That as your Honourable Board has hitherto, in conjunction with the Lords Commissioners of the Admiralty, refused to sanction a line of railway passing over, through, or under Greenwich Park, your memorialists trust your Honourable Board will continue to oppose any scheme by which such an object is proposed to be attained.

—That your memorialists, therefore, most respectfully pray that your Honourable Board will on this, as on former occasions, refuse its consent to the South Eastern Company's proposed line of railway through Greenwich Park.

And your Memorialists will ever pray, &c.

W. A. Soames, Vicar.
William Neale, } Churchwardens.
William Clark, }
F. T. Hudson.
B. Carter.
George Reeve.
Henry Keell.
George Carpenter.
James Laing.
John Morley.
E. W. James,
Vestry Clerk, &c.

Croom's Hill, Greenwich, March 1846.

— (E.) —

Sir, Office of Woods, &c. 27 March 1846.

I HAVE, on behalf of the Commissioners of Her Majesty's Woods, &c., to acknowledge the receipt of your letter dated the 20th instant, transmitting a memorial from the vicar, churchwardens, and other inhabitants of the parish of Greenwich, soliciting that this Board will withhold their consent to the Bill now before the House of Commons to enable the South Eastern Railway Company to construct a railway from Greenwich to Chilham to pass through Greenwich Park; and I have, in reply, to acquaint you, for the information of the memorialists, that the Board have notified their objections to the promoters of this measure, and informed them that they will not recommend that the consent of the Crown should be given to any line of railway that shall pass through Greenwich Park.

I am, &c.
(signed) *A. Milne.*

E. W. James, Esq.

— (F.) —

Gentlemen, Office of Woods, &c. 27 March 1846.

THE attention of the Board having been directed to a Bill now before Parliament to enable the South Eastern Railway Company to construct a branch from the London and Greenwich Railway, to join the Canterbury, Ramsgate, and Margate Railway, in the parish of Chilham, county Kent, with an alternative loop to pass through Greenwich Park,

I have, on behalf of the Commissioners of Her Majesty's Woods, &c., to acquaint you that they have informed the promoters of this measure that the Board cannot recommend that the consent of the Crown should be given to any line of railway that shall pass through Greenwich Park, and with reference to such communication I have to request that you will attend to the progress of this Bill.

I am, &c.

The Solicitors. (signed) *A. Milne.*

— (G.) —

My Lord and Gentlemen, 20 March 1846.

(A.) (C.) I HAVE the honour to acknowledge the receipt of two letters addressed to the Board, from Mr. Lethbridge, the secretary to the Commissioners for Greenwich Hospital, respecting the proposed branch of the South Eastern Railway, which is intended to be carried through or under Greenwich Park, with the instructions of the Board that I should report thereon.

I therefore waited on Mr. Lethbridge to procure the plans of the line, was accompanied by him over that part of the Park proposed to be traversed by the railway, and subsequently procured the plans from the solicitors to the Commissioners.

From these it appears, that the proposed line would enter the Park at Croom's Hill, and pass through it to Maize Hill; and though it is described as a tunnel (851 yards in length), yet by the section the top of this tunnel is above the surface level of the Park, 220 yards in length.

It is evident, therefore, that an open cutting would have to be made for this portion, and if afterwards formed into a covered way, it would be requisite to raise the surface of the Park to the extent of this length. The remainder of the tunnel, or covered way, must also be made by open cutting, excepting eight chains, nearest Croom's Hill; and it is probable, that if this part were tunnelled, the ground would fall in, and the surface be disturbed.

The works of this part of the proposed line may, therefore, be regarded as forming a cut through the Park in this direction, which would interfere very objectionably with its appearance while the works were in hand, and would be injurious to the recreation and enjoyment of the public, independently of the inconvenience to the establishment of Greenwich Hospital by the intersection of their water-pipes, and the annoyance of the schools referred to in Mr. Lethbridge's letter.

The line intersects four pipes, one of which is the main laid from the reservoir in the Park to protect the buildings from fire, and which main it is important to protect from disturbance, as a fire might occur during the time required for its connexion.

If, therefore, the convenience of the establishment, the provision for its safety, and the public recreation and enjoyment in a place of such interest as Greenwich Park, be objects of consideration, the present line would interfere most objectionably with all; and as another line, free from these objections, could easily have been taken, there does not appear to be the slightest reason for the Board to give its sanction to this part of the proposed branch.

Plan 1. Plan 2. With this Report are enclosed the two letters from Mr. Lethbridge, and the plan and section of the proposed line through the Park.

I beg

I beg leave to add, that I have not thought it requisite to confer with any officers of the South Eastern Railway Company on this subject, the section itself having enabled me to come to a conclusion as to the cutting, &c. required.

I have, &c.

The Commissioners of Her Majesty's Woods, &c. (signed) *Thomas Page*, Civil Engineer.

— (H.) —

Sir, Office of Woods, &c. 26 March 1846.

THE attention of the Commissioners of Her Majesty's Woods, &c. having been directed to the Bill before Parliament for a proposed branch of the South Eastern Railway from Greenwich to Chilham, which it is intended should be carried through or under Greenwich Park, and having had under their consideration a report from the engineer, who was instructed to report on the effect which the proposed measure would have on the Crown property in this Park,

I have, on behalf of the Commissioners of Her Majesty's Woods, &c., to acquaint you, for the information of the promoters of this undertaking, that they cannot recommend that the consent of the Crown be given to any line of railway that shall pass through Greenwich Park.

I am, &c.

J. P. Fearon, Esq. (signed) *A. Milne.*

— (I *a.*) —

South Eastern Railway Office, 35 *a*, Great George-street, Westminster, 1 May 1846.

My Lord and Gentlemen,

REFERRING to the communications which I have had the honour to make, on the part of the South Eastern Railway Company, with reference to a proposed line of railway under Greenwich Park, I am instructed by the directors of that company to submit to the consideration of your Honourable Board the following additional statement.

The measure has, as you are aware, been up to this time opposed by the Lords of the Admiralty, on the ground of apprehended injury to the Royal Observatory.

The directors of this company have, however, been informed that there is reason for believing that their Lordships have, on further examination, been led to doubt whether any sufficient grounds for such apprehension exist.

If this should be so, it would then appear that the only objection which could remain on the part of your Honourable Board would be interference with the ornamental character of the Park.

The directors of this company have, under these circumstances, and feeling the extreme importance of the subject, again consulted their engineer, with the view of removing all objection on the last-named ground, and I am to state to your Honourable Board that there are the means of doing so.

It appears that the tunnel, as at present laid down through the Park, would, if executed at its present level, render it necessary slightly to raise the turf at the western part of the Park.

This, it was considered, in preparing the design, might be done without at all altering the character of the Park, or interfering with its convenience as a place of public resort; but it is found, that if any objection should be raised to this part of the plan, the level of the tunnel may be lowered two feet, which would leave the surface precisely at its existing level.

The directors have also considered it desirable to consult Mr. Decimus Burton and Mr. Nesfield on the subject generally, with the view of so framing the scheme as to remove all possible objection.

I beg leave to lay before the Board the Reports of those gentlemen, with the plan annexed.

It appears from these Reports, that a most material improvement in the

public convenience of the Park may be effected by opening a new approach by a road parallel to the railway from the point where it will cross London-street, Greenwich, to Croom's Hill and the Park.

This improvement, I am authorized to say, the South Eastern Railway Company will be prepared to make, and also to construct a new and ornamental gateway into the Park at the end of such proposed new approach on the east side of Croom's Hill, and to carry into effect, under the direction of your Honourable Board, the other improvements suggested in those Reports, if they should meet with your approbation, or so to modify them as you may direct.

It appears from the Report of Mr. Stephenson, the engineer to the company, that the difficulty raised as to interference with the water-pipes supplying Greenwich Hospital may very readily be removed; and as the line through the Park will be throughout in tunnel, there will be no noise.

The directors of this company venture to express a hope, that if, as they are advised, a material public improvement may be carried into effect without any detriment to the Royal domain in question, and probably with some improvement to it, the consent of the Crown will not be withheld to the proposed tunnel through Greenwich Park.

In order to satisfy your Honourable Board that there are strong reasons, on the ground of public convenience, in support of the proposed line under the Park, I beg leave to state, that it is the only course by which a direct communication can be made from the terminus at Greenwich to Woolwich; that the saving in distance between London and Woolwich (the accompanying Plan (A) shows the two lines) by this route, as compared with that by Blackheath, will be one mile, two furlongs, and 188 yards, and the saving of expense in construction upwards of 100,000*l*.

Plan [A.]

That, in addition to these advantages, a most material increase of accommodation will, in practice, be given to the public, if the line be direct to Woolwich through Greenwich, inasmuch as all trains serving Woolwich, and many of those to and from more distant points, would at the same time serve Greenwich; whilst, if the line by Blackheath be adopted, the trains for Woolwich and the eastward must necessarily be independent of those for Greenwich.

I have, &c.
(signed) *John P. Fearon.*

The Commissioners of
Her Majesty's Woods, &c.

— (I *b*.) —

Gentlemen, 6, Spring Gardens, 30 April 1846.

As desired by you, I inspected yesterday and to-day Greenwich Park, for the purpose of considering more particularly that portion of the Park under which a railway tunnel is designed to be executed, according to a plan and section with which I was furnished by your engineer, Mr. Robert Stephenson, my instructions being to ascertain, and report my opinion, whether by the construction of a tunnel, injury to the scenery of the Park would be occasioned; and I beg leave to report, in the first place, that as the line of the proposed tunnel would pass at a right angle under three avenues of trees, at only three to five feet under the surface of the ground, the trees at those three places would necessarily be to be removed to the extent of perhaps four to five trees in each avenue. The avenues are at present not perfect, the trees being of various ages, some in a state of decay, and they are not planted at regular distances.

I find that as the top of the tunnel, towards the west end of the Park, is marked on the section nearly level with the surface of the ground, there would be a necessity to deposit earth in that district to cover the tunnel. The raising of the surface of the Park here would be an improvement, as it is at this time under, or below the public road, Croom's Hill, provided that the earth filling be not extended so far as the trees. I should, however, state, that since my inspection I have been informed by your engineer that the tunnel may be constructed at a depth under the surface so as to render it unnecessary to raise the present surface of the sward.

It struck me forcibly in proceeding through Greenwich, that the present tortuous

tortuous course through narrow streets is mean and unworthy to be the principal and London approach to the Royal Park. I inspected, therefore, the district between the Park and the railway station in London-street, Greenwich, with the object of finding a line for a more direct and spacious road, which obviously presents itself adjoining and parallel to that laid down for your proposed railway. I think, for the above reasons, that the Commissioners of Her Majesty's Woods, &c. should, in the event of the railway being permitted to pass under the Park, require that a public road, not less than 40 feet wide, should be formed in the line above proposed, and as explained on the accompanying sketch plan; and that handsome architectural Park entrance gates should be erected opposite to the east end of this new road, according to a design to be approved by the Commissioners. From this, which would be the principal, and most frequented gate of the Park, a drive or wide gravel walk should extend thence eastward, through, and across the three avenues of trees which run north and south, and as the line for this drive would be that of the tunnel, the removal of the trees consequent upon the execution of the tunnel would not therefore be to be regretted. Indeed I cannot but think that the subdivision, as at present, of the northern portion of the Park into three compartments, like fields or paddocks, by the existing lines of trees, is far from being satisfactory, and that the three openings, as well as others through these belts, might be made with real and important advantage to the scenery.

Plan 3.

Desirous of having my views confirmed or controverted on these points of landscape gardening, I invited, with your permission, Mr. Nesfield to visit the locality, and study the subject. He has accordingly been on the spot this day, and I believe coincides generally with the above opinions, and has stated his views in a separate Report to yourselves.

As the backs of the buildings north-west of the Park offer most unsightly appearance, I think that in lieu of the present low paling and hedge a high and handsome wall should be built, extending from Croom's Hill to the north gate, by the new church, which should be masked by a mound of earth, planted with shrubs and evergreens, inclosed with an iron railing.

On the whole, I have no hesitation in stating my opinion, that so far from the scenery of the Park being injured by the proposed tunnel, it might be conderably improved in effect, whilst, in addition, the opportunity would be afforded of obtaining for the public most important advantages through the means of the approach and vista I have referred to.

I presume, always, that a mere right of way under the surface of the Park is applied for by the railway company, and that the ground would be broken up, and the tunnel constructed in short lengths, the surface being reformed and thrown open to the public previous to a fresh opening being made, each of such portions of the work being temporarily, and from time to time fenced in, so as thus to interfere as little as possible with the recreation and safety of the numerous visitants of the Park.

I am, &c.

To the Directors of
The South Eastern Railway Company.

(signed) *Decimus Burton.*

— (I *c.*) —

To the Directors of the South Eastern Railway Company.

Gentlemen, College, Eton, 30 April 1846.

Having been requested by Mr. D. Burton, as I understand at your desire, to inspect Greenwich Park, with referencee to a tunnel you are desirous of carrying under it, and to the consequences it might have upon the general appearance of the scenery, I proceeded there to-day, having been furnished with your plan and sections, and I beg leave to make the following observations.

In criticising the lower part of Greenwich Park, its introduction from the west at once induces an unfavourable impression, not only as to character, but particularly as to extent, inasmuch as the eye is confined to a monotonous area, bounded by elm avenues, without one compensating point of interest, thus indi-

cating a town square, rather than a component part of a palatial park, whose space should appear as indefinite as art could devise.

Although the geometric manner of planting, when properly applied to, or combined with architecture, is highly desirable, and strictly legitimate on principle, yet when *à propos* to nothing (as in the present instance), it by no means conduces to dignity or good effect, however lofty the trees may be.

In reply to the question arising from the requirements of the projected railway tunnel, it is evident (from the section) that, according to its width, so must certain trees give way, by reason of its crown being so near the natural surface.

On deliberating artistically, however, on this matter (with the desire of alleviating the aforesaid evil by mild means, rather than doing violence to a mass of trees, which although unfortunately planted, are nevertheless venerable from their growth), it appears that as the gaps will not be diagonal with reference to the squares, that they may be turned to a very advantageous account on the score of the ornamental.

In fact, were no railway proposed, the general effect of the Park would be materially improved by the two following propositions, which, with little exception, apply happily to the case under consideration:

1st. That a handsome stone gate should be erected on the west side of the Park, next Croom's Hill, sufficiently advanced towards the first avenue of trees, so as to afford a good point of sight as well as to combine it with the trees.

2d. That through the gaps caused by the tunnel, a main approach should be carried eastward till it intersects the present approach from the second north entrance.

The surface immediately on the left of the west entrance, now one of a most ignoble character, leading from nowhere, for a short distance dips two feet below the tunnel crown on the section shown to me, which would require that a retaining wall should be built to uphold the filled in earth over the line of tunnel, in order to avoid burying a group of elms at the north-west angle of the Park, which ought to be preserved as essentially important, not only as a flanking feature to the said west gate, and the first north gate, but as a mask to the unsightly buildings outside that part of the Park.

The second avenue stands on a terrace some five or six feet above the general surface, and at too steep an inclination to be approached on the east or west sides, either by a walk or drive; this might easily be improved by adding to the base of the slope generally.

East of the third line of trees (*i. e.* at the end of the second square) the ground to the right rises very abruptly, and roughly; here considerable improvement might be accomplished by filling up various holes, and likewise so amplifying the shoulder of the hill as to make a mound coinciding with the centre of the proposed vista, whereon to place a colossal statue, or any other appropriate architectural object as a terminus.

Thus the present monotony would be relieved without infringing on public recreation, or convenience with regard to shady walks in hot weather, and the improvement of general effect cannot for a moment be controverted.

I am, &c.

(signed) *W. A. Nesfield.*

— (K.)—

(Immediately.)

Sir, Admiralty, 2 May 1846.

With reference to your note of this day's date, enclosing extract of a letter dated 1st instant, from Mr. Fearon, addressed to the Commissioners of Her Majesty's Woods and Forests, I am commanded by my Lords Commissioners of the Admiralty to acquaint you, that, as at present advised, they see no reason to withdraw their objections to the proposed line of the South Eastern Railway under

under Greenwich Park, and that Mr. Fearon is, therefore, in error in stating, as he does in his letter of yesterday's date, that my Lords are disposed to doubt there being sufficient grounds for continuing these objections.

I am, &c.

Alexander Milne, Esq., &c. &c. &c. (signed) *W. A. B. Hamilton.*
Office of Woods and Forests.

— (L.) —

Sir, Office of Woods, &c. 2 May 1846.

The Commissioners of Her Majesty's Woods, &c. have had under their consideration your letter of yesterday's date, in which you state that the directors of the South Eastern Railway Company had been informed that the Lords of the Admiralty, who had opposed the passing of the proposed railway from Greenwich to Chilham, under Greenwich Park, in consequence of the injury which might thereby be done to the Royal Observatory, were disposed to withdraw their opposition; and I have to acquaint you that this Board have communicated with the Lords of the Admiralty upon this subject, and that they have received a letter from that Board, from which it appears that their Lordships do not intend to withdraw their objections to the passage of the proposed line of railway under Greenwich Park, and that, under these circumstances, this Board see no reason to alter their determination of opposing the passing of this measure, as already communicated to the company.

I am, &c.

J. P. Fearon, Esq. (signed) *A. Milne.*

— (M.) —

Sir, Office of Woods, &c. 6 May 1846.

I am, on behalf of the Commissioners of Her Majesty's Woods, &c., to acquaint you, for the information of the Commissioners of Greenwich Hospital, that it has been stated to this Board, on the part of the promoters of the South Eastern Railway from Greenwich to Chilham, that the Lords of the Admiralty have withdrawn their objections to the passing of the proposed railway through Greenwich Park; and it having been further stated to this Board, that the objections they felt themselves called upon to urge with respect to the interests of the Crown in Greenwich Park under their charge, may be obviated by carrying the railroad across the Park in a tunnel, and at such depth as shall not ultimately alter the present level of the surface of the Park ground, and that the apprehended inconvenience, by intersecting the pipes carrying the water through the Park from the conduits to the Hospital buildings, and also from the large reservoir recently constructed, may be obviated by passing the pipes and mains conveying that water under the bed of the railway, and the company having, in addition to these proposed modifications of their plans, also proposed to execute various works calculated to promote the convenience and enjoyment of the public resorting to the Park, this Board has referred these proposals for immediate consideration and report by Mr. Page, an engineer already consulted by them on this subject; and I am to add, that in the event of Mr. Page's Report being favourable as to the practicability of the proposed modified plans, this Board is disposed to recommend the consent of the Crown to the proposed measure, subject to such stipulations and conditions as shall, on further consideration, appear to them to be advisable.

I am, &c.

J. A. Lethbridge, Esq. (signed) *A. Milne.*

— (N.) —

Sir, Office of Woods, &c. 6 May 1846.

With reference to your Report dated the 20th ultimo, upon the subject of the passage through Greenwich Park of the Chilham Branch of the South Eastern Railway, I have to acquaint you that, in reply to the objections urged by this Board to this line of railway, they have received a letter, dated the 1st instant, from Mr. J. P. Fearon, in which he states that the proposed tunnel through Greenwich Park would, if executed as at present laid down, render it necessary slightly to raise the turf at the western part of the Park, but that if any objection should be taken to this part of the plan, the level of the tunnel could be lowered to the extent of two feet, which would leave the surface of the Park precisely at the existing level; and also that the directors of the Company had consulted with Mr. Decimus Burton and Mr. Nesfield, with the view of so framing the scheme as to remove all possible objection, and that from the Reports of those gentlemen it appears that a most material improvement in the public convenience of the Park may be effected by opening a new approach by a road parallel to the proposed railway, from the point where it will cross London-street to Croom's Hill and the Park.

Mr. Fearon further states, that he is authorized to say that the South Eastern Railway Company will be prepared to construct a new and ornamental gateway into Greenwich Park at the end of the proposed new approach on the east side of Croom's Hill, and also to carry into effect certain other improvements which have been suggested to them by Mr. Burton and Mr. Nesfield, if approved of by the Board.

With regard to the injury which it was apprehended would be done to the pipes which supply Greenwich Hospital with water, Mr. Fearon states that Mr. Stephenson, the engineer to the company, is of opinion that this difficulty may very easily be removed.

And I am, on behalf of the Commissioners of Her Majesty's Woods, &c., to request that you will ascertain and inform them, at your earliest convenience, whether any, and if so, what arrangements might be made with regard to the levels of the portion of the railway in question which will pass through Greenwich Park, by which the same may be carried into effect without detriment to the convenience of the public.

I am, &c.

Thomas Page, Esq. (signed) *A. Milne.*

— (O.) —

South Eastern Railway Office, 35*a*, Great George-street,

Dear Sir, Westminster, 7 May 1846.

Inclosed I send a copy of the letter from the Admiralty with reference to Greenwich Park; I am informed that the Commissioners of Woods will receive an official communication from the Admiralty to the same effect, and I send this only for your satisfaction in the meantime. Mr. Rich called at your office with the original letter to produce it to you, as he had promised, but found that you were not within.

I am, &c.

Alex. Milne, Esq. (signed) *J. P. Fearon.*

— (P.) —

(Immediate.)

My Lord, Admiralty, 7 May 1846.

I am commanded by my Lords Commissioners of the Admiralty to acquaint your Lordship that my Lords will withdraw their opposition to the South Eastern Kent Railway Bill, on the understanding that the railway is to be carried through a tunnel under Greenwich Park, and that such clauses as the Admiralty may think proper to require be inserted in the Bill, giving power to the

the Admiralty to regulate the speed and weight of the trains to pass through Greenwich Park, and if it be found necessary, to stop the passing of the trains through it altogether, under such penalties as the Board of Admiralty may require.

I have, &c.

The Viscount Torrington. (signed) *H. Corry.*

— (Q *a.*) —

REPORT on the Passage of the South Eastern Railway through Greenwich Park.

My Lord and Gentlemen, 8 May 1846.

I HAD the honour to receive your instructions (6th May) directing me to ascertain and report to the Board, if certain arrangements proposed by Mr. Fearon, on the part of the South Eastern Railway Company, for altering the levels of that portion of the railway which is proposed to pass through Greenwich Park, may be carried into effect without detriment to the convenience of the public. Mr. Fearon states that the proposed tunnel would, if executed as at present laid down, render it necessary slightly to raise the turf on the western part of the Park, but that if any objection should be taken to this part of the plan, the level of the tunnel could be lowered to the extent of two feet, which would leave the surface of the Park precisely at the existing level.

Having, on the 20th March last, reported to the Board generally upon the probable effect of the proposed works, I now beg leave to state that on receipt of the last instructions, I caused levels to be taken along the line, to ascertain the practicability of Mr. Fearon's proposal; and I also (by the Board's direction, in a letter to Mr. Lethbridge) communicated with him on the subject, and requested that the views of the Commissioners of Greenwich Hospital, both with regard to their pipes for protecting the building in case of fire, and other requirements, should be expressed in writing. On application to Mr. Fearon, I have this day been favoured with a transverse section of the proposed tunnel, or covered way, which shows a height of not more than 18 feet above the level of the rails, and a width of 24 feet between the walls.

With these dimensions, and a thickness of 3 feet 6 inches of ground above the top of the girder, the covered way would be under the lowest part of the Park on the line of the railway if lowered 2 feet 5 inches, and therefore, with this alteration, Mr. Fearon's proposal is practicable, though the covered way would be much lower than the tunnels on railways.

With reference to the trees which would be affected by the work, I find, on examination, that commencing at Croom's Hill there are six large elms and three small ones, which must be destroyed, taking a width of 21 feet from the centre of the railway, and without allowing for injury which may arise from touching the roots of others; that on the first avenue there are three very lofty elms, seven fine elms, but smaller, and three small chesnuts; on the second avenue five elms and seven chesnut trees of various sizes, and three lofty elm trees near Maize Hill. The effect of the works upon the trees last named and those of the two avenues will depend on the manner in which they are executed, as there would be a depth of from 16 to 23 feet ground at these points between the top of the tunnel and the surface of the ground.

It follows, therefore, that after the works are completed, the surface of the Park may be restored to its present state; and should the Board's consent be given to the measure, stringent regulations as to the season, time, and manner of executing the works will be required.

Having now reported on the practicability of Mr. Fearon's proposal, I would ask leave to suggest the following circumstances for the consideration of the Board:

1st. The line in question is only an alternative line between Greenwich and Charlton, another line through Lewisham being secured by the company, who therefore appeal to the Board in a case not affecting their obtaining a line, but to obtain an alternative, which it is calculated will save expense, inasmuch as it will save distance.

2d. That this alternative line has been laid down with regard only to obtaining a straight route, and without regard to taking a line through the Park which would be least injurious to it.

3d. That if a Park of such universal interest as Greenwich Park is selected for the direction of a railway, merely to avoid distance, or property built upon, the compensation required should be regulated by the value of property of the latter description; and that any permission granted by the Board for using the Park for such a purpose, and in a case where the passing of the Bill does not depend on this permission, must operate as a precedent for other lines, or extension of lines to be laid down through other metropolitan parks, and for objects of really public importance, and the refusal of the Board to sanction such lines or extensions might be expected to incur complaints of injustice, &c.

Feeling the subject to be one of greater importance, by reason of its being used as a precedent, than most others connected with railways on which I have had the honour to report to the Board, I have thought it my duty to submit to their consideration the above remarks, which are independent of the practicability of carrying out this part of the line, but which must necessarily bear upon future applications to the Board.

Plev 4 (Q b.) Plan 5.

I beg leave to enclose, herewith, a section of the line through the Park, showing the rails 2 feet 5 inches lower than the Parliamentary plan; also a statement from Mr. Sivell, superintendent under the Greenwich Hospital Commissioners, respecting the pipes; and sections of the tunnel from Mr. Stephenson.

I have, &c.

The Commissioners of
Her Majesty's Woods, &c. &c. &c.

(signed) *Tho. Page.*
Civil Engineer.

— (Q *b.*) —

Sir, Greenwich Hospital, 8 May 1846.

HAVING, in consequence of a letter from the Commissioners of Her Majesty's Woods and Forests, addressed to the Commissioners of the Hospital, relative to the alternative loop of the South Eastern Railway passing through Greenwich Park, been directed by the Commissioners to furnish you with such observations relative to the proposed plan of carrying the water-pipes of the Hospital from the conduits and reservoirs (for the supply of the Hospital, and in case of fire) under the projected tunnel,

I beg to state, for your information, that the plan proposed has several objectionable parts:

1st. The carrying the pipes under the tunnel would form a deposit, which there would be no means of removing.

2d. Should the pipes require to be discharged at any time, it will also preclude the means of doing so.

3d. The object for which the large main was laid will in part be defeated: the friction of the pipes will be such as to reduce its power, which is now sufficient in case of fire, without the aid of engines.

I am, &c.

Thomas Page, Esq. (signed) *W. Sivell.*

— (R.) —

HAVING, in company with Mr. Page, gone over the line where it is proposed to tunnel for making a railway through Greenwich Park, commencing at Croom's Hill on the west, and passing eastward in the direction of Maize Hill, and having directed my attention to the effect likely to be produced on the trees in the Park by the proposed cutting, I am of opinion that the cutting of a tunnel, such as the one proposed, would in a few years cause the destruction of a great many of the trees forming the avenues in the Park. Independent

of

of those trees, which must necessarily be removed, where the cuttings are intended to be open at Croom's Hill, I am of opinion that the tunnel would so affect the drainage of the Park by diverting the usual course of moisture, that the trees on each side of the tunnel, to a considerable extent, would in a few years languish and die, and that to a considerable extent, probably 200 or 300 yards, or even to a greater distance from the tunnel.

The strata to all appearance being of a gravelly nature, the worst consequences may be reasonably entertained.

Old trees, such as those in Greenwich Park, are particularly sensitive to any diversion of the customary moisture, and although it is impossible to determine precisely the extent of the damage the trees would sustain from the proposed tunnel, yet it would most probably be very extensive.

I am also of opinion that the springs which supply the Hospital with pure water would be dried up, as the source from which the water is obtained is much higher than the proposed tunnel.

(signed) *J. Mann*,
Superintendent of St James's and Hyde Parks.

10, Stafford-row,
9 May 1846.

— (S.) —

My Lord and Gentlemen, 9 May 1846.

To-day I met at Greenwich, by appointment of the Board, Mr. Mann, the Superintendent of the Public Parks in the west of London, and pointed out to him the line on which the South Eastern Railway Company propose to carry their Chilham Branch through Greenwich Park, explained the depth of the covered way or tunnel from the surface, and informed him, that in my Report to the Board, of yesterday's date, I had stated the number of trees on the west side of the Park which would positively be destroyed by the works, but that with regard to others which might suffer, I had given the number contained within 21 feet of the centre of the railway, the depth of ground which would be left under them, and that the degree of damage would depend on the nature of the ground, and the manner in which the works might be executed; that it had since occurred to me the depth of cutting for the tunnel would affect the springs supplying Greenwich Hospital with water.

Mr. Mann said, that in the absence of sections of the strata, it would be difficult to give a precise opinion on the extent of injury likely to result to the trees, but at a moderate computation it might be expected they would be destroyed in a few years to a distance of 20 yards from the centre of the line, in consequence of their being deprived of the moisture which now nourishes them, and which the cutting or tunnel for the railway would in all probability take away; and he quoted an instance of similar injury done in Kensington Gardens by draining some ground. This observation also reminded me of a statement made by the person in charge of the Botanical Gardens at Chelsea, viz., that the injury done to the plants and trees arose from the sewers having been carried to a lower level for improving the drainage, which had had the effect of withdrawing the moisture from the roots.

Having sent for Mr. Sivell, superintendent of the works at Greenwich Hospital, and questioned him concerning the strata, he stated that within five feet of the surface it consisted of gravel; and as to the effect on the springs by any sinking or cutting, he referred to a well sunk by Mr. Collins, of Maize Hill, which had considerably reduced the quantity of water obtained from a conduit (marked (A.) on the accompanying Plan), but the precise decrease he could not state. Plan 6.

This conduit, he says, supplies the best water. In a well sunk in Mr. Tierney's garden, at the spot (B.), the water stands at 30 feet.

From the statement of Mr. Sivell, and from my own experience on the drainage of strata, it may be concluded that the springs for supplying Greenwich Hospital will be injuriously affected by the proposed work, and from Mr. Mann's experience, extensive injury will be done to the trees; but on this

part of the subject, I would beg leave to suggest that the Board avail themselves of all the practical knowledge of the officers in their department.

My attention having been called to the proposal of Mr. Decimus Burton, for the formation of a gravel walk through the Park over the line of railway, for the erection of new gates, and formation of approaches, I beg leave to state that in my Report yesterday I did not refer to this part of the Board's instructions, inasmuch as this proposal does not relate to the engineering part of the subject; but I would now remark (that which is sufficiently obvious on the line) that the line of railway is not at right angles to the avenues, and should the permission of the Board be given for the railway to pass through in this direction, and new entrances and walk be determined on, the direction of the line should be at right angles to the two middle avenues, which it would cross, as shown on the accompanying plan.

With respect to the line through the Park interfering least with its present appearance, I am of opinion that a line following its northern boundary from the gatekeeper's lodge at church gates to the Park Lodge, east of the Naval School, and then passing partly along Mr. Tierney's garden, would be attended with fewer objections (assuming the withdrawal of moisture from the trees could be compensated for) than any other line north of the Observatory. On the particulars of this line, with regard to levels and other arrangements, I will report, should it be the wish of the Board, when the requisite levels and information have been obtained.

I have, &c.

The Commissioners of Her Majesty's Woods, &c. &c. &c.

(signed) *Thos. Page,*
Civil Engineer.

— (T *a.*) —

My Lord and Gentlemen, Victoria Park, 11 May 1846.

I HAVE, in company with Mr. Cormack, met Mr. Page in Greenwich Park, this afternoon, and we are of opinion that the elms will not be materially injured in two of the avenues which are proposed to be crossed by the tunnel of the railway, but in the first the tunnel will be so near the surface that the trees immediately over the roof will be scarcely worth saving.

Whilst with Mr. Cormack in drawing up his opinion, which I enclose with this, it did not occur to me that I asked Mr. Page about the openings for getting out the soil in the tunnelling, and I remember he made the remark that much of it would be surface cutting, and filled in again; this may be done in the middle of the open squares, but certainly not when within 30 or 40 feet of those large trees, many of the roots of which run 80 or 100 feet from the stems, and ought not to be severed at less than 30 or 40 feet.

The greatest danger is, that the roof of gravel will drop in from the lower surface of the roots; this would injure those trees immediately over the cutting; but two convenient gaps in the avenues already occur, and the side trees are very fine, and with care may do well.

The partial injury to the roots ought to be compensated by judicious pruning of the heads of those trees near the cutting next winter; and if during the following summer the trees show loss of foliage in consequence of the drainage, their heads should be pruned, to compensate for the deficient sap, for it must be remembered most of the trees are already ripe timber.

Precaution ought to be taken to prevent surface water from escaping too quickly, by making a broad, almost imperceptible ridge, to secure it from running down hill.

I have, &c.

To the Commissioners of Her Majesty's Woods, &c.

(signed) *Saml. Curtis,*
In charge of the Plantations in the Victoria Park.

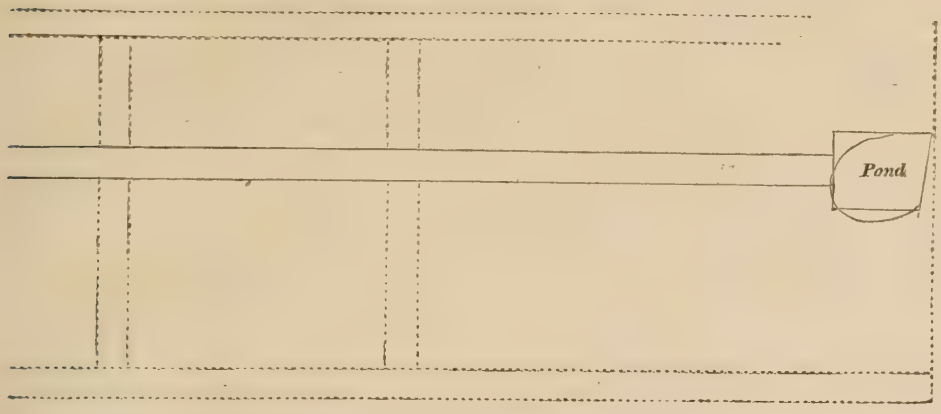
— (T *b.*) —

Gentlemen, Nursery, New Cross, 11 May 1846.

I HAVE inspected with Mr. Curtis, accompanied by Mr. Page, the proposed line of tunnel of the South Eastern Railway Company, which will cross three avenues of trees in Greenwich Park, and Mr. Curtis and myself concur in opinion, that by keeping the open space as much as possible in the accompanying diagram, the distant avenues will not be affected, and even in those which are proposed to be crossed, that no trees but those immediately adjoining the proposed excavation will be injured, the trees being principally elms, and the subsoil solid gravel, the roots will be found to float on the face of the gravel, and are fed from distant surface soil.

I have, &c.

To the Commissioners of Her Majesty's Woods and Forests. (signed) *A. H. Cormack.*



— (U.) —

South Eastern Railway Office, 35 *a*, Great George-street, Westminster, 12 May 1846.

My Lord and Gentlemen,

THE directors of the South Eastern Company having understood that your Honourable Board have found some difficulty, with reference to the tunnel through Greenwich Park, from an apprehension that the trees on either side of the line of the tunnel may be injured by the draining off the natural moisture in the soil, I am instructed to state, that that subject has been very carefully considered by the engineer and other competent advisers of the company, some of them being persons of much experience in the management of timber trees, and they are prepared to produce evidence, either to Her Majesty's Commissioners of Woods, or to the Committee sitting on the Bill, which they think must entirely remove all apprehension as to any detriment to trees standing off the line. The tunnel will be carried through in cement, and will consequently be entirely impervious to water. It is the earnest wish of the Board to be allowed to present such evidence.

I have, &c.

Commissioners of Her Majesty's Woods, &c. (signed) *John P. Fearon.*

— (V *a.*) —

South Eastern Railway Office, 35 *a*, Great George-street, 12 May 1846.

My Lord and Gentlemen,

IN reference to the line proposed by the South Eastern Railway Company through Greenwich Park, I have the honour to enclose a copy of a letter I have received from Mr. Robert Clutton, on the subject of the elm trees there; Mr. Clutton is a man of much experience, and he may probably be known to you, as one of the surveyors of the Ecclesiastical Commissioners.

I have, &c.

The Commissioners of Her Majesty's Woods and Forests. (signed) *John P. Fearon.*

— (V *b.*) —

Dear Sir, 8, Whitehall-place, 12 May 1846.

In the management of extensive country estates, I have had great experience in the management of elm and other timber, and have a full practical knowledge of the habits of trees.

I have been extensively employed in planting trees and cutting timber; I have been engaged in planting, both for the purpose of profit and ornament.

I have examined that part of Greenwich Park through which it is proposed to carry the South Eastern Railway, and I have made myself acquainted with the mode by which it is intended to pass through it, and I am firmly and fully of opinion that the lines of elm trees, north and south of the proposed railway, will not in any way be injured by the line.

I am confident, that in the lines of trees intersected by the railway, only those trees will be affected which are actually on the line, or within 15 feet of it.

Those within 15 feet will be only for a time affected; they will, after two or three years, recover entirely from any injury which the cutting at first does them. I am confirmed in this opinion by an acquaintance with railway cuttings, through grounds in which trees are growing, and by every experience relating to the growth and habit of elm, which can give confidence to my opinion.

I may add, that I am the owner of nearly 400 acres of land, which I farm and manage myself, and on nearly the whole of which the elm is the natural growth of the soil.

I remain, &c.

(signed) *Rob. Clutton*,
Hartswood, Reigate.

John P. Fearon, Esq.
South Eastern Railway Office.

— (W.) —

Copy Statement transmitted by Viscount *Torrington* to the Chief Commissioner.

David Stewart, of 94, Great Russell-street, London, surveyor and land agent, can prove that for about 50 years he has had very extensive experience in the management of property, and has paid particular attention to the culture and growth of trees of all kinds.

That he has been informed of the proposal of the South Eastern Railway Company to construct a railway through a tunnel under Greenwich Park, and assuming that such tunnel will be arched over and made waterproof, he conceives that no possible injury will be sustained by trees at a distance of about 10 feet from the tunnel.

That the roots of the trees should be cut off smoothly at a distance of from one to two feet from the tunnel, and fresh soil of a light or sandy quality laid near the side of the tunnel, in which the roots will spring out afresh in all directions, so that the tree will soon derive even more nourishment than it did before. That the tunnel being made waterproof, no apprehension can be entertained of any injury to the trees from drawing off the water.

— (X.) —

My Lord, Greenwich, 13 May 1846.

Referring to the conference with which your Lordship obligingly honoured the Rev. Mr. Soames (vicar of this parish) and myself yesterday, on the subject of the mode proposed for the crossing of the town of Greenwich and the Royal Park by the South Eastern Company's North Kent Line of Railway, I am directed very respectfully to draw your Lordship's attention to that part of the proposed line at Croom's Hill where the entrance of the archway of the tunnel under the Park is intended to be made, and to state, that as there is a very considerable quantity of traffic and passage of carriages and horses on the roadway of Croom's

Croom's Hill, and the entrance from thence to the Circus, near such proposed archway, and great danger would be likely to arise from the frightening of horses by the passing of the trains, it would be very desirable that the cutting westward of Croom's Hill should be covered by an archway to the extent of 25 or 30 yards (or more, if possible) westward of the carriage-way of Croom's Hill, so as to prevent the chance of accidents by trains when passing being heard or seen therefrom.

The Right Honourable the Viscount Canning, &c. &c. &c.

I have, &c.
(signed) *E. W. James,*
Vestry Clerk, &c.

— (Y *a.*) —

South Eastern Railway Office, 35 *a*, Great George-street, Westminster, 13 May 1846.

My Lord and Gentlemen,

By the instruction of the Board of Directors of the South Eastern Railway Company, I take the liberty of sending, for your consideration, a Report from Mr. Nesfield, on the subject of the trees in Greenwich Park.

I have, &c.
(signed) *John P. Fearon.*

The Right Honourable the Commissioners of Her Majesty's Woods, &c. Whitehall.

— (Y *b.*) —

Greenwich Park.

Gentlemen, Eton, 13 May 1846.

Having been requested by you, with reference to my Report of the 30th ult., to consider and communicate to you my opinion as to the probability of additional trees being destroyed by the construction of a tunnel on the line laid down on your engineer's (Mr. R. Stephenson's) plan, beyond those trees which, of course, must be moved altogether in making the open excavation for the tunnel, which I understand will be about 35 feet wide,

I beg leave to state, that as the tunnel will be waterproof, and therefore the natural moisture of the soil will not be drained off, no injury whatever can accrue to the trees beyond a short distance from the edges of the excavation.

I have had occasion to visit professionally many large estates where improvements have been effected, involving cases analagous to the one in question, and in the event of a doubt arising on the aforesaid statement, I can adduce, among others, the following examples, where cuttings exist without injury to neighbouring trees, or even to those on the verges:

At Worsley (Lord F. Egerton), a cutting, in 1842, for an approach, varying to 16 feet in depth. At Crewe Hall (Lord Crewe), an approach, in 1841 to 1842, through a wood, whose greatest depth of cutting is about nine feet. At Sandling Park (W. Deedes, Esq., M. P.), a railway tunnel, three or four years ago, under a wood. At Keel Hall (R. Sneyd, Esq.), above six years ago, a cutting more than 20 feet deep, through a very old wood.

I therefore have no hesitation in stating that trees will thrive whose boles stand from 15 to 20 feet from the edges of cuttings.

I am, &c.
(signed) *W. A. Nesfield.*

To the Directors of the South Eastern Company.

— (Z.) —

Report respecting the direction of the Line through *Greenwich Park*, to suit the Avenues.

My Lord and Gentlemen, 14 May 1846.

According to your instructions of the 13th instant, I proceeded to lay down a line in which the proposed branch of the South Eastern Railway

could be carried under Greenwich Park at the levels referred to in my Report of 8th instant, and with reference to the condition of the line being at right angles to the centre avenue, so that the proposal for forming a new walk through the Park, in the direction of this line, with suitable approaches, might be carried into effect, if the passage of the railway through the Park should receive the sanction of the Board.

The heavy rain which fell during the afternoon and evening prevented the observations being made with sufficient accuracy, and they were unavoidably deferred until this morning, when they were taken, and also measurements made of the trees within 50 feet of each side of the line, and which are laid down on the accompanying plan.

Plan 7.

From these measurements it appears that on the west side of the Park, near Croom's Hill, eight trees will be destroyed in executing the works of the railway, five of which are very large, and three of smaller dimensions, and that 16 trees will be passed under by the tunnel between the west avenue and Maize Hill, six of which are very large. On the probable effect of the work on these, Mr. Curtis, the curator of the Victoria Park, who accompanied me, will report.

From the Parliamentary sections, and the increased depth of 2 feet 5 inches by lowering the rails to pass under the Park, there appears to be no difficulty in the company's acceding to the views expressed by the Rev. Mr. Soames (vicar of Greenwich), in Mr. James's letter to Lord Canning (13th May), of continuing the covered way to a distance of 20 yards west of Croom's Hill, and I have therefore suggested that the Board should stipulate not only for this but for a similar extension of the covered way eastward of Maize Hill. It would also be desirable for the public that the rise of 5 feet proposed to be made in London-street should be reduced; but any reduction here would increase the gradient between this point and the junction with the Greenwich line.

Having suggested that the company should purchase property to be planted and added to the Park, with other stipulations for rendering the railway as little objectionable as possible to the neighbourhood, and in a former Report given a comparison of the value to the company of a line through the Park, it is not requisite to add more, except that the plan showing the trees will enable the Board to judge of any variation in the line which may be proposed, restricted, however, at one end to passing through the houses at Maize Hill, and to avoiding a large elm tree near the gate at Croom's Hill.

All the documents relating to the subject and referred to me are herewith returned.

I have, &c.

The Commissioners of Her Majesty's Woods, &c. &c. &c.

(signed) *Thos. Page*, Civil Engineer.

— (A A.) —

My Lord and Gentlemen, Victoria Park, 16 May 1846.

I HAVE attended Mr. Page to Greenwich Park again this day, in order to mark such trees as come within the line of the cutting for the South Eastern Railway. Commencing at the east end, there is one middle-sized elm which need not be destroyed, as the tunnel there will be very deep, and if left standing will prove the effect.

The first avenue east, here the roof of the tunnel will be 17 feet deep. I would not destroy a tree; there are three small elms and two small chesnuts over the cutting, also one very large elm very near it, but from the depth, and by careful excavation, this may be saved.

The second avenue east contains one very large elm and a small chesnut in the first row, two middle-sized elms in the second row, two middle-sized elms and a small sycamore in the third, and three large elms in the fourth row. As the cutting will be 16 feet deep, I would not destroy any of these trees, but commence the tunnelling 25 feet from the avenue on each side, and should the earth or gravel fall in from below the roots, I would complete the roof and open a well hole over the arch, and fill the vacancy betwixt the roots and the brickwork

brickwork with earth, as close as possible; this being done in five places, will make the trees safe, thus:

The third avenue from the east being only 3 ft. 9 in. deep, I fear the trees cannot be made safe. In the first row are three very large elms, and one so near as to require great care to save it; in the second row is a large elm; in the third row, two large elms; and in the fourth row, a large elm and a chesnut. All these, I fear, must be sacrificed: but the elm in the first row, which comes near the cutting, I would try to save; and if the tunnel is made a semi-circular arch, it will help it very much, as it will also a noble elm at the west end of the tunnel, which will come within seven or eight feet of the excavation; but the semi-circular arch, and careful excavating, will save this very fine tree, which must not be destroyed, if possible to save it with care.

Although I before stated there were gaps in two of the avenues which would facilitate the line of cutting, it would do little good to diverge from the straight line, because it would not save the trees at the west end of the tunnel.

I am, &c.

To the Commissioners
of Her Majesty's Woods, &c.

(signed) *Samuel Curtis,*
In charge of the Plantations
in the Victoria Park.

— (B B.) —

Sir, Office of Woods, &c. 15 May 1846.

With reference to your letter dated 7th instant, I am, on behalf of the Commissioners of Her Majesty's Woods, to acquaint you, that the Lords Commissioners of the Admiralty having, by letter from their secretary the Right Hon. H. Cory, dated the 7th instant, signified, "that they will withdraw their opposition to the South Eastern Railway Bill, on the understanding that the railway is to be carried through a tunnel under Greenwich Park," and subject to certain other conditions mentioned in the said letter, the Commissioners of Her Majesty's Woods, &c., in so far as regards the interests of the Crown in Greenwich Park under their charge, are willing to recommend, that the proposed railway be permitted to pass through Greenwich Park, by a tunnel to be constructed and used as a right of way, or easement, appendant to the said railway, but without vesting in the railway company any rights of soil, or any other right, in or over or under the surface of any part of the said Park, and subject to the following further conditions.

That in forming the said tunnel through the Park, the works shall be executed at such times, and in such manner, and subject to such regulations for the ingress and egress of the workmen as shall be required by the Commissioners of Her Majesty's Woods, &c., and that no portion of the tunnel which shall have been executed by open cutting shall be finally covered up until the same shall have been inspected and certified to have been, in all respects, executed to the satisfaction, and under the supervision of an engineer or inspector to be appointed by the said Commissioners, and paid by the said company.

That the tunnel, or covered way, shall be made perfectly water-tight, that the moisture from the ground may be as little as possible withdrawn, and its construction, and the mode of operating, and the season, and time allowed for executing the works, shall be regulated by the Commissioners of Her Majesty's Woods, &c., and under an engineer appointed by them, and paid by the company; and all works required to be done for the preservation of the trees by the proper officers of the Board during the execution of the railway works, shall be done at the company's expense.

That the tunnel shall be carried in a straight line across the Park, from west to east, so as to pass at right angles through the two avenues of trees now in that part of the Park, according to a plan signed by yourself and by Mr. Page, and deposited in the Office of Woods. Plan 8.

That it shall be constructed through the Park in such portions by open cuttings, and in such portions by tunnelling, as shall be required by the said Commissioners, and at such a level below the present surface as that, when completed, the top of the arch of the tunnel shall in no part be within less than 2 feet of such present surface, in or through which there shall be no opening or access to or from the tunnel into the Park.

That where the present surface is to be broken, the turf shall be carefully taken up and laid aside, to be restored over the same surface when the works are completed.

That the extent of surface to be broken shall not exceed 36 feet in width at any point, and that longitudinally the work shall be executed in divisions of not more than 40 yards, to be opened at one and the same time, of which 30 yards are to be finally completed, covered over, and returfed to the satisfaction of the said Commissioners, before any further portion be opened.

That the works in progress shall be hoarded in by fences of sufficient height to exclude the public, and that such hoards be kept up till the turf be relaid and consolidated, and the green sward be properly restored.

That the ground to be excavated shall be taken wholly out of the Park, or if allowed to be deposited therein, shall be laid down, levelled, and turfed, where required by the Commissioners of Woods, &c.

That the company shall continue the tunnel or covered way west of Croom's Hill, and east of Maize Hill, to a distance of 30 yards from each of these roads.

That all waterpipes, mains, and services within the Park, which shall be affected by the formation of the tunnel, shall be made good to the satisfaction of the said Commissioners.

That in compensation for the privileges to be given, and the damage to be caused, and in addition to the money payment hereinafter mentioned, there shall be formed and completed, by and at the expense of the South Eastern Railway Company, a new approach, of not less than 40 feet in width, from or near London-street, Greenwich, to the west or Croom's Hill side of the Park, with architectural gates of entrance, according to plans and designs to be approved by the Commissioners of Woods, &c., together with a wide mall or walk leading from the said gates across the Park to other similar gates on the east side thereof, to be also, with the gates and mall or walk hereinbefore mentioned, erected and completed at the expense of the said railway company; and that in addition to these said several works, there shall be paid to the said Commissioners, for the improvement of the Park, and in consideration of the permission and privileges to be granted, the sum of 10,000 *l.*, viz. 5,000 *l.* to be paid previously to the commencement of the works within the Park, and 5,000 *l.* on the opening of the railway to Woolwich for public traffic and conveyance.

I am, &c.

J. P. Fearon, Esq., &c. &c. &c. (signed) *A. Milne.*

— (C C.) —

South Eastern Railway Office, 35 *a*, Great George-street,
Sir, Westminster, 16 May 1846.

I HAVE the honour to acknowledge the receipt of your letter of the 15th instant, conveying the assent of Her Majesty's Commissioners of Woods and Forests to the passage of the railway proposed by the South Eastern Company in a tunnel under Greenwich Park, subject to the conditions therein specified.

I am instructed by the directors of this company to accept such conditions, and to engage on their part to perform them.

I have, &c.

Alex. Milne, Esq. (signed) *John P. Fearon.*

— (D D.) —

Gentlemen, Office of Woods, &c. 18 May 1846.

On behalf of the Commissioners of Her Majesty's Woods, &c. I transmit to you herewith a copy of a letter addressed by this Board to Mr. J. P. Fearon, the Secretary to the South Eastern Railway Company, stating the terms and conditions upon which this Board would recommend the consent of Her Majesty to be given to the passing of the proposed railway from Greenwich to Chilham, through Greenwich Park, and also copy of a letter which they have received from Mr. Fearon in reply, dated the 16th instant, accepting these conditions on behalf of the company, and I am to request that you will prepare and submit to the Board the clauses necessary to be inserted in the Bill now before Parliament for carrying such conditions into effect.

I am, &c.

The Solicitors. (signed) *A. Milne.*

— (E E.) —

My Lord, Greenwich, 19 May 1846.

The parochial authorities of this town having understood that the consent of the Commissioners of Woods and Forests has been given to the South Eastern Railway Company to make this proposed railway through, and under Greenwich Park, I am desired to express a hope that your Lordship will be pleased to favour us with a copy of the terms, regulations, and conditions upon which such consent has been given.

I have, &c.

The Right Hon. the Viscount Canning, &c. &c. &c. (signed) *E. W. James.*

— (F F.) —

Sir, Office of Woods, &c., 21 May 1846.

With reference to your letter, dated the 19th instant, stating, as vestry clerk of Greenwich, that the parochial authorities of this town understand that the consent of this Board has been given to the South Eastern Railway Company to make their proposed branch to Chilham, through, and under Greenwich Park, and expressing a hope that the Board will favour them with a copy of the terms and conditions on which such consent has been given,

I have, on behalf of the Commissioners of Her Majesty's Woods, &c., to inform you, that they have, in their arrangements with the railway company, taken every means for protecting the interests of the parish, and of the public generally, but that such arrangements are so mixed up with conditions, which exclusively concern the proceedings of this Board, as to render it inexpedient, in the Board's opinion, to comply with your request.

I am, &c.

E. W. James, Esq. (signed) *A. Milne.*

— (G G.) —

TO Her Majesty's Commissioners of Woods, Forests, &c.

The Memorial of Sir Isaac Lyon Goldsmid, bart., Chairman; the Most Noble the Marquis of Conyngham, the Honourable William Ashley, Sir Brook William Bridges, bart., the Honourable Charles John Murray, Captain George William St. John Mildmay, Michael M'Chlery, Charles M'Garel, Frederick Mildred, William Peters, John Diston Powles, Henry Thoby Prinsep, Joshua Walker, and George Whitmore, Esquires, the other Members of the Committee of Management of the North Kent Railway Company,

Sheweth,

That the said company was formed for the construction of a direct and independent line of railway from London to Dover and Deal, in the shortest

possible direction, passing entirely through the north of Kent, and embracing in route the most important naval and military establishments of the empire, connecting them with the metropolis and with each other:

That the South Eastern Railway Company having already a line of railway to Dover through a different part of the country, and 15 miles longer than the one projected by your memorialists, could only oppose your memorialists' Bill now in Parliament by proposing another line to Dover generally similar to, and in several of the most important parts identical with, the plans brought forward by your memorialists, thereby monopolizing the entire of this important district of Kent, in opposition to the wishes of the population expressed at public meetings in all the principal towns:

That some of the present promoters of the North Kent Line of Railway brought forward a scheme for a North Kent Railway so long ago as the year 1840, with a view to which, your memorialist, Sir Isaac Lyon Goldsmid, then, as now chairman, and the present engineer of the proposed company, had communications with the officers of the Admiralty with respect to the passage of the railway through or near to Greenwich Park, and upon that occasion it was expressly stipulated, and required by the Admiralty authorities, that the said railway should be kept at a distance of at least half a mile from the Royal Observatory in Greenwich Park:

That in a letter addressed to Sir Isaac Lyon Goldsmid by the secretary of the Board of Admiralty, on the 28th of November 1840, there is the following paragraph:

"My Lords have no objection to the railway passing as proposed to the southward of the Royal Observatory, provided it does not approach that building within half a mile, that being the distance to which it was originally promised to restrict it, and which restriction their Lordships most distinctly desire may be enforced."

That on the renewal of the said undertaking in the last, and in the present Session of Parliament, the same condition of keeping half a mile from the Royal Observatory was required by the Admiralty, and submitted to by your memorialists:

That in compliance with this condition, the engineer of the company laid down the present line so as to pass through Blackheath in a tunnel, at the distance of nearly 1,000 yards from the Royal Observatory:

That your memorialists have, under the circumstances aforesaid, considered that the question as to the passage of the railway through Greenwich Park had been conclusively settled in the negative, and particularly so, after the letter of the Honourable Sidney Herbert to the President of the Board of Trade on the 28th day of January 1845, as follows:—

"My dear Dalhousie, "Admiralty, 28 Jan. 1845.

"In reply to your note of the 24th instant, I beg to say that the Board had on such satisfactory grounds decided that no railway shall pass between the Royal Observatory in Greenwich Park and the River, and have so often repeated that decision to various applicants, that it cannot now be too peremptorily stated, nor too generally known, I am sure that you may also consider such decision as conclusive.

"Yours, &c.

"The Earl of Dalhousie, (signed) "*Sidney Herbert.*"
&c. &c."

That on the 6th June 1845, a letter was addressed to the chairman of a meeting of the inhabitants of the town of Greenwich, as follows:—

"Sir, "Admiralty, 6 June 1845.

"Having laid before my Lords Commissioners of the Admiralty your memorial of the 21st May, on behalf of the inhabitants of the town of Greenwich, praying their Lordships' interference to prevent the extension of the Greenwich Railway to Croom's Hill, I am commanded by their Lordships to acquaint you that they disapprove of the proposed extension, and will not give their consent to the Bill for that purpose.

"I am, &c.

"Rev. W. A. Soames, (signed) "*W. A. Hamilton.*"
Greenwich."

That

That the Select Committee of the House of Commons, on the 16th of March last, began their sittings upon the several Railway Bills for a North Kent district, brought in by your memorialists, and by the South Eastern Railway Company; and at the commencement of the proceedings it was distinctly stated, by the counsel for the South Eastern Company, that their alternative line through Greenwich Park was abandoned on account of the objection of the Admiralty authorities that they should proceed for their north line, which passed round Blackheath; and a similar statement was made by the engineering witnesses of the South Eastern Company then under examination:

That it was only on the close of the proceedings of the Committee on the 7th May, and after they had been sitting for nearly two months, that, to the great surprise of your memorialists, a consent on the part of the Board of Admiralty for the passing of the South Eastern line through the Park was tendered to the Committee by the South Eastern Company:

That the Committee afterwards determined to open their proceedings for the purpose of receiving such assent, and any evidence connected therewith:

That further adjournments took place to enable the South Eastern Company to put in the assent of the Commissioners of Woods and Forests:

That the said Committee having met on the 18th May instant, finally determined to report to the House of Commons in favour of the South Eastern Company's line through Greenwich Park, and to Gravesend only, by reason whereof the large traffic coming from that direction must be passed through the tunnel of Greenwich Park, and be subject to all the contingencies which may arise from the conditions of the Admiralty assent:

That the consent of Her Majesty's Commissioners of Woods, &c. has been given upon a condition which the South Eastern Company cannot fulfil, viz. the making of a carriage-road and approach, of 40 feet wide, from London-street to the Park entrance, inasmuch as the space between their limits of deviation is no more than 60 feet, which will not be sufficient for the railway, and also the carriage-way; and your memorialists also submit, that as the trains must be passed in an open cutting, and as those trains are intended to pass every quarter of an hour, both ways, the passing of frequent trains so near to such road or approach cannot fail to produce great danger to the public passing in carriages or on horses along the said carriage-road or approach:

That the depth of the proposed cutting is not sufficient to admit of the said carriage-road or approach being constructed over the said railway:

That your memorialists having, on their part, laid out their line in conformity to restrictions imposed by, and having obtained the express sanction thereto of the Honourable the Board of Admiralty, feel themselves greatly aggrieved by reason of the assents which their opponents obtained for the passage of their line through Greenwich Park, at the very last moment of their proceedings before the Committee, and by which they obtained a most undue advantage over your memorialists.

Your memorialists therefore pray, that your Honourable Board will take all the circumstances into consideration, and they trust that it may be yet thought fit to withdraw an assent, which has served to give to the South Eastern Company a very important and undue advantage over your memorialists.

(signed) *Isaac L. Goldsmid,*
Chairman of the Committee of Management.

(H H.)

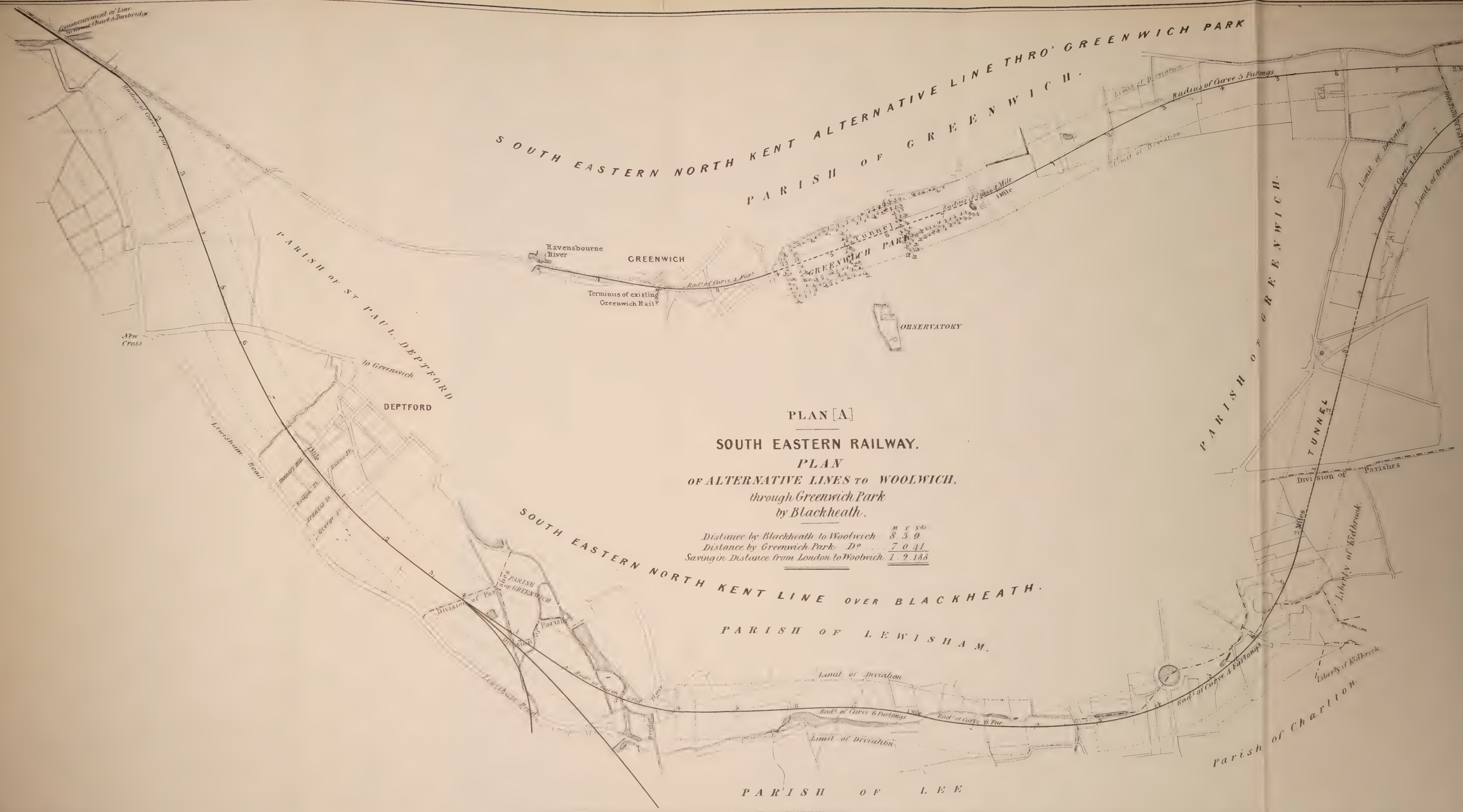
Sir, Office of Woods, &c. 27 May 1846.

On behalf of the Commissioners of Her Majesty's Woods, &c. I have to acknowledge the receipt of a memorial, signed by yourself on behalf of the promoters of the North Kent Railway, soliciting, for the reasons stated therein, that the consent given by this Board to the passing of the Chilham branch of the South Eastern Railway through Greenwich Park may be withdrawn,

And I am to acquaint you, for the information of the memorialists, that this Board having been informed that the objections of the Admiralty to the crossing of Greenwich Park by the proposed line of railway had been withdrawn, and that the South Eastern Railway Company were prepared to conform to all the conditions which the Board considered it necessary to impose, with a view to the protection of the Crown property under their charge, they did not see reason any longer to refuse their consent to the passage of this line through Greenwich Park; but that if, as the memorialists assert, the South Eastern Railway Company cannot comply with the conditions referred to, this Board will, of course, consider themselves no longer bound by that consent.

I am, &c.

Sir J. L. Goldsmid, Bart. (signed) *A. Milne.*



PLAN [A]

SOUTH EASTERN RAILWAY.

PLAN

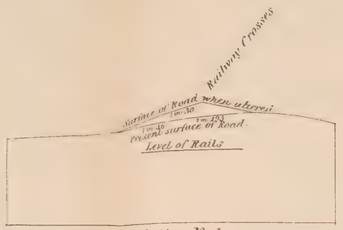
OF ALTERNATIVE LINES TO WOOLWICH,

through Greenwich Park

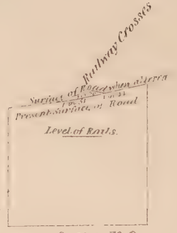
by Blackheath.

	M	F	Yds
Distance by Blackheath to Woolwich	8	3	9
Distance by Greenwich Park Do	7	0	41
Saving in Distance from London to Woolwich	1	2	188

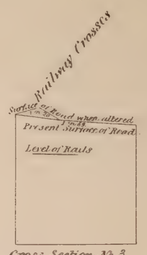
ALTERNATIVE LOOP LINE FROM GREENWICH TO CHARLTON.



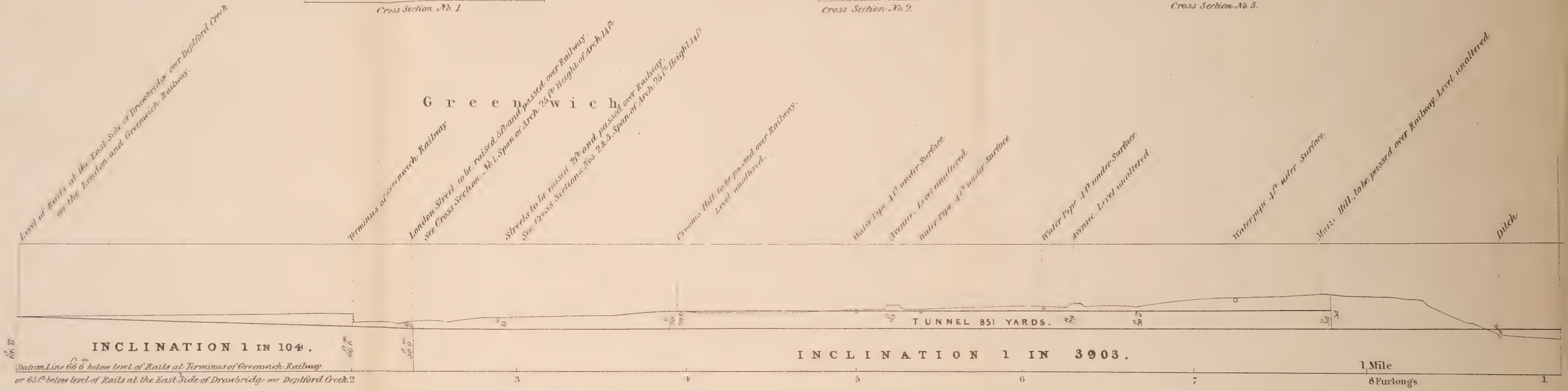
Cross Section No. 1.



Cross Section No. 2.



Cross Section No. 3.


Level of Rails at the East Side of Drawbridge over Deptford Creek on the London and Greenwich Railway.
Greenwich
Terminus at Greenwich Railway
London Street to be raised 6ft and passed over Railway. See Cross Section No 1. Span of Arch 25ft Height of Arch 14ft
Streets to be raised 2ft and passed over Railway. See Cross Sections Nos 2 & 3. Span of Arch 25ft Height 14ft
Croome Hill to be passed over Railway. Level unaltered.
Water Pipe 4ft under Surface
Avenue. Level unaltered.
Water Pipe 4ft under Surface
Water Pipe 4ft under Surface
Avenue. Level unaltered
Water pipe 4ft under Surface.
Mount Hill, to be passed over Railway. Level unaltered.
Ditch
TUNNEL 851 YARDS.
INCLINATION 1 IN 104.
INCLINATION 1 IN 3903.
Datum Line 66ft 6in below level of Rails at Terminus of Greenwich Railway.
or 65ft below level of Rails at the East Side of Drawbridge over Deptford Creek.
2
3
4
5
6
7
1 Mile
8 Furlongs
1

Present Surface of Road

Level of Rails.

Cross Section No 4.

Road to be raised 18 and passed over Railway.
See Cross Section No 4. Span of Arch 30 Height of Arch 14 F.

Level of Rails

Surface of Road when altered

Present Surface of Road.

Cross Section No 5.

Road to be raised 18 and crossed on a level. See Cross Section No 5.

Occupation Road

Junction with the Proposed North Kent Railway

INCLINATION 1 IN 3903.

INCLINATION 1 IN 799

2 Miles
8 Furlongs

Total Length 2 Miles, 2 Fur. 31 Ch.

Vertical Scale for Cross Section.

Vertical Scale for the Longitudinal Section.

Horizontal Scale for Longitudinal & Cross Section.

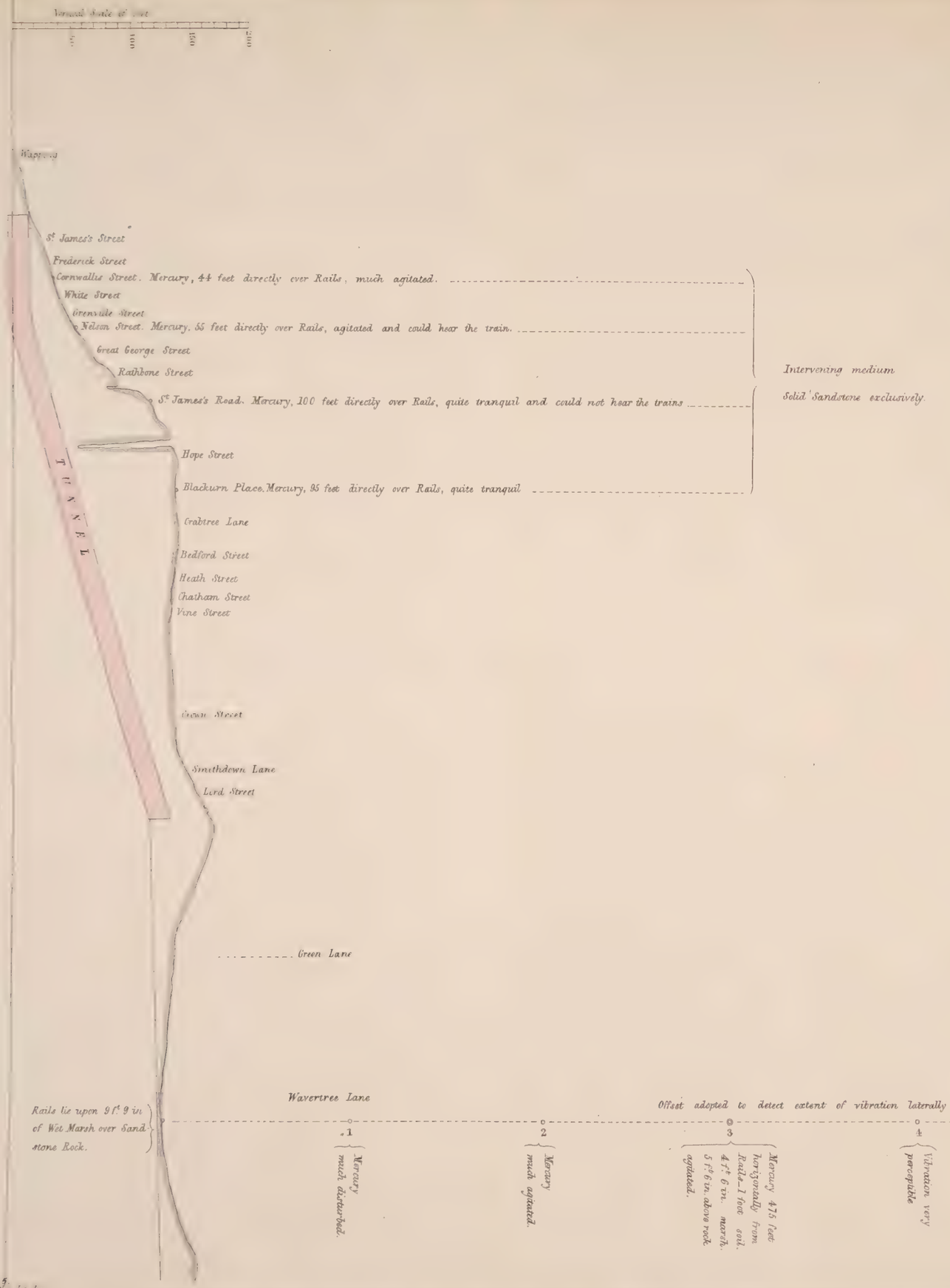
No 394.

Ordered, by The House of Commons, to be Printed, 16 June 1846.

London: James Harrison, Printer.

A Rough Section of the
***RAILROAD TUNNEL** under **LIVERPOOL**,*
Explanatory of Observations on its imparting tremor.

July 1835. (Sig.d) H. M. Denham.


Vertical Scale of feet
0
100
150
200
Wapping
St. James's Street
Frederick Street
Cornwallis Street. Mercury, 44 feet directly over Rails, much agitated.
White Street
Grenville Street
Nelson Street. Mercury, 55 feet directly over Rails, agitated and could hear the train.
Great George Street
Rathbone Street
St. James's Road. Mercury, 100 feet directly over Rails, quite tranquil and could not hear the trains
Intervening medium
Solid Sandstone exclusively.
Hope Street
Blackburn Place. Mercury, 95 feet directly over Rails, quite tranquil
TUNNEL
Crabtree Lane
Bedford Street
Heath Street
Chatham Street
Vine Street
Crown Street
Smithdown Lane
Lord Street
Green Lane
Wavertree Lane
Rails lie upon 9 ft. 9 in. of Wet Marsh over Sandstone Rock.
Offset adopted to detect extent of vibration laterally on same level in open air
1 Mercury much disturbed.
2 Mercury much agitated.
3 Mercury 475 feet horizontally from Rails—1 foot soil. 4 ft. 6 in. marsh. 5 ft. 6 in. above rock agitated.
4 Vibration very perceptible
5 Vibration perceptible
6 Mercury 942 feet horizontally from Rails—6 feet 6 in. soil above Rock at above, — vibration scarcely perceptible.
7 Mercury 1110 feet horizontally from Rails—obstruction. loose Sand 3 feet, Marsh 9 feet 6 in. 12 ft. 6 in. above Sand stone rock, vibration exhausted

Nº 375. Ordered, by The House of Commons, to be Printed, 10th June. 1846.
Luke James Hansard, Printer.

SKETCH PLAN

REFERRED TO IN **Mr D. BURTON'S REPORT**, DATED 30TH APRIL.

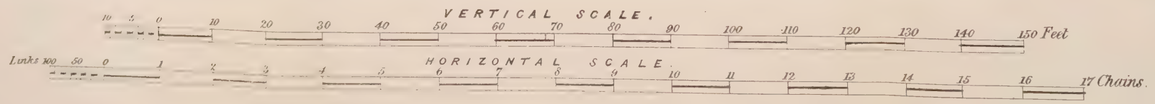
1846.

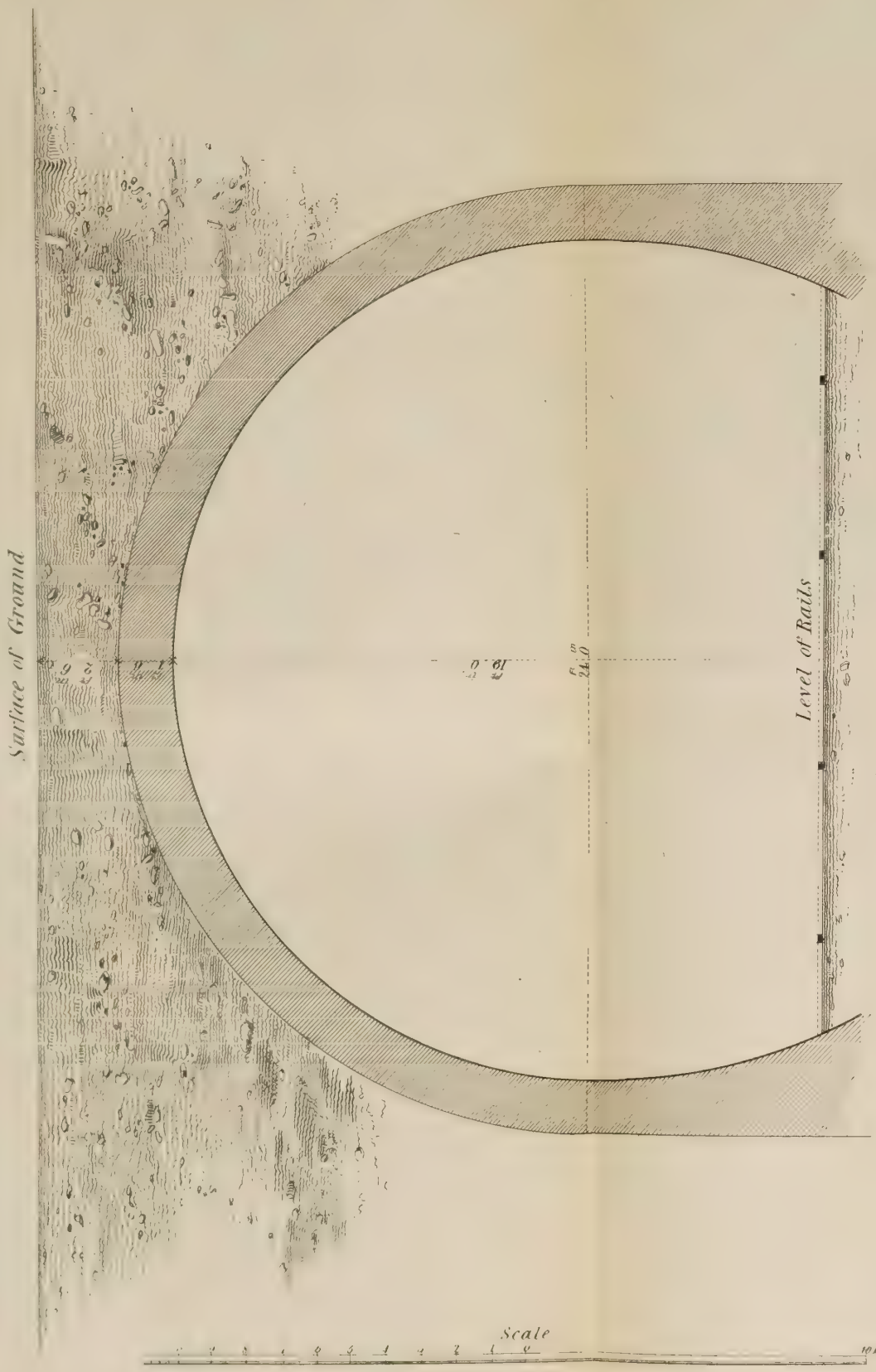
GREENWICH HOSPITAL.

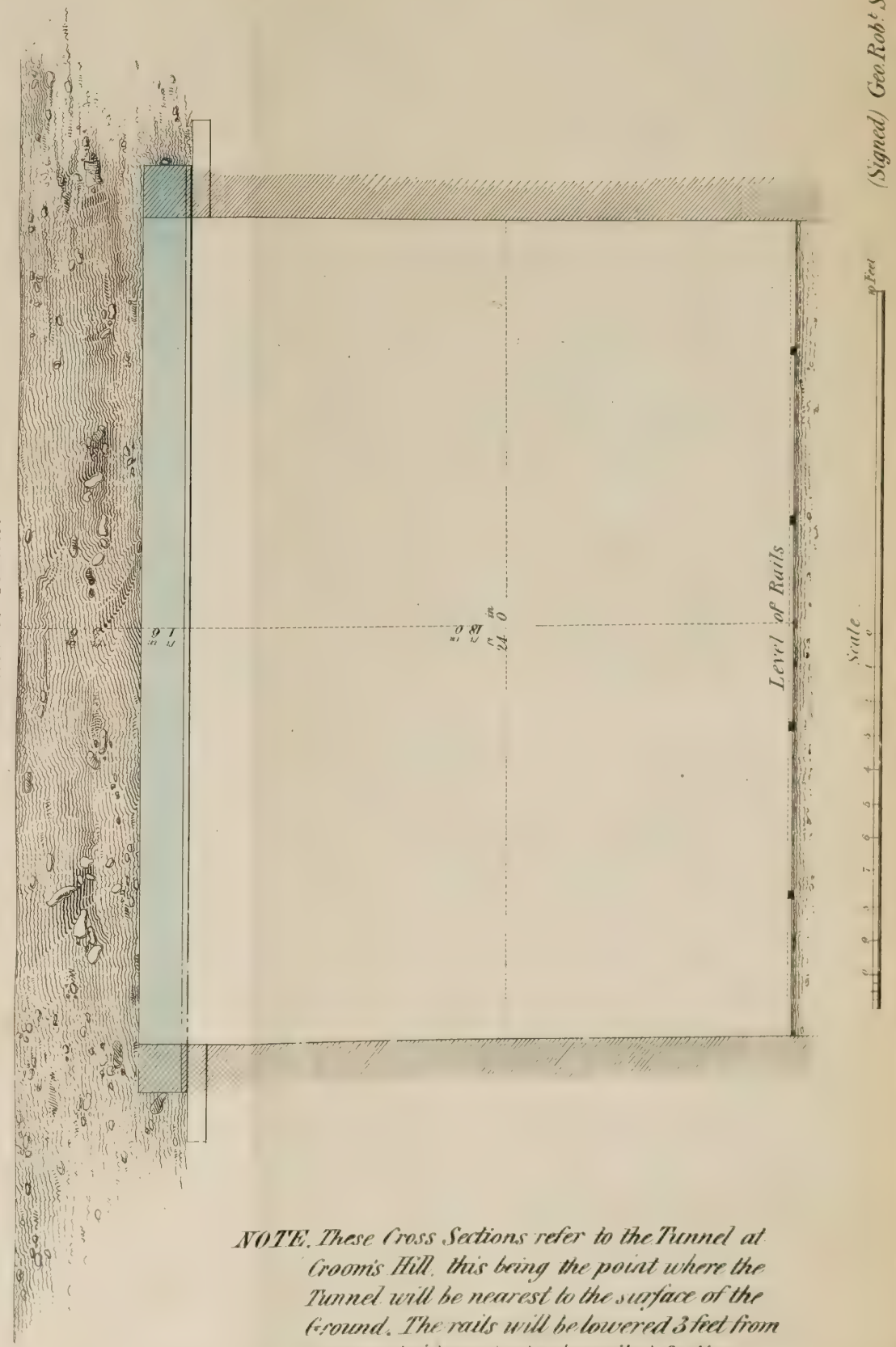
SOUTH EASTERN RAILWAY.

SECTION *Shewing the depth of the Rails through GREENWICH PARK, to avoid raising the Surface.*

T U N N E L

Level of Rails in deposited Plan.
Suggested Level of Rails.

TRANSVERSE SECTION OF PROPOSED TUNNEL THROUGH GREENWICH PARK.





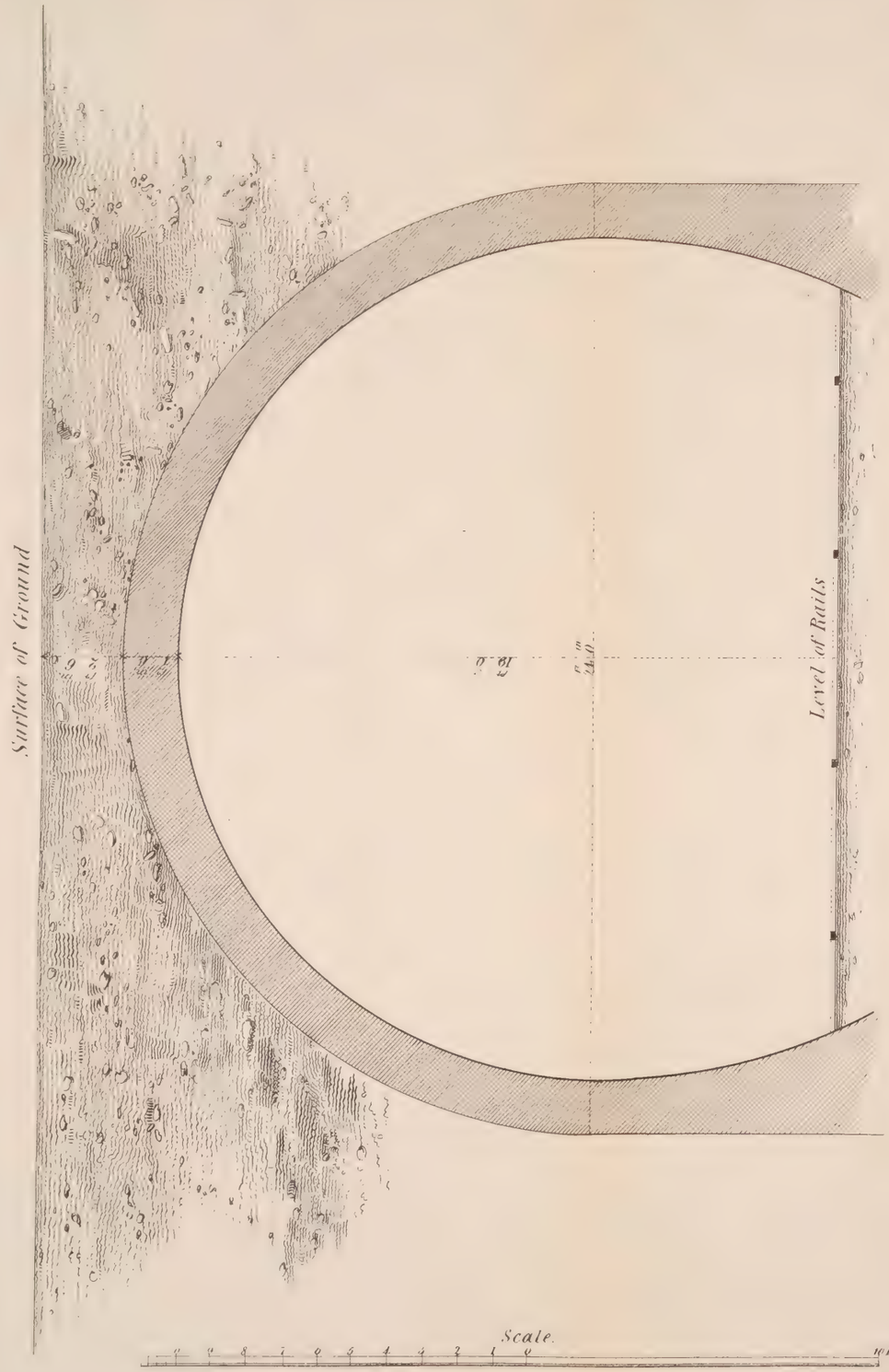
(Signed) Geo. Robt Stephenson.

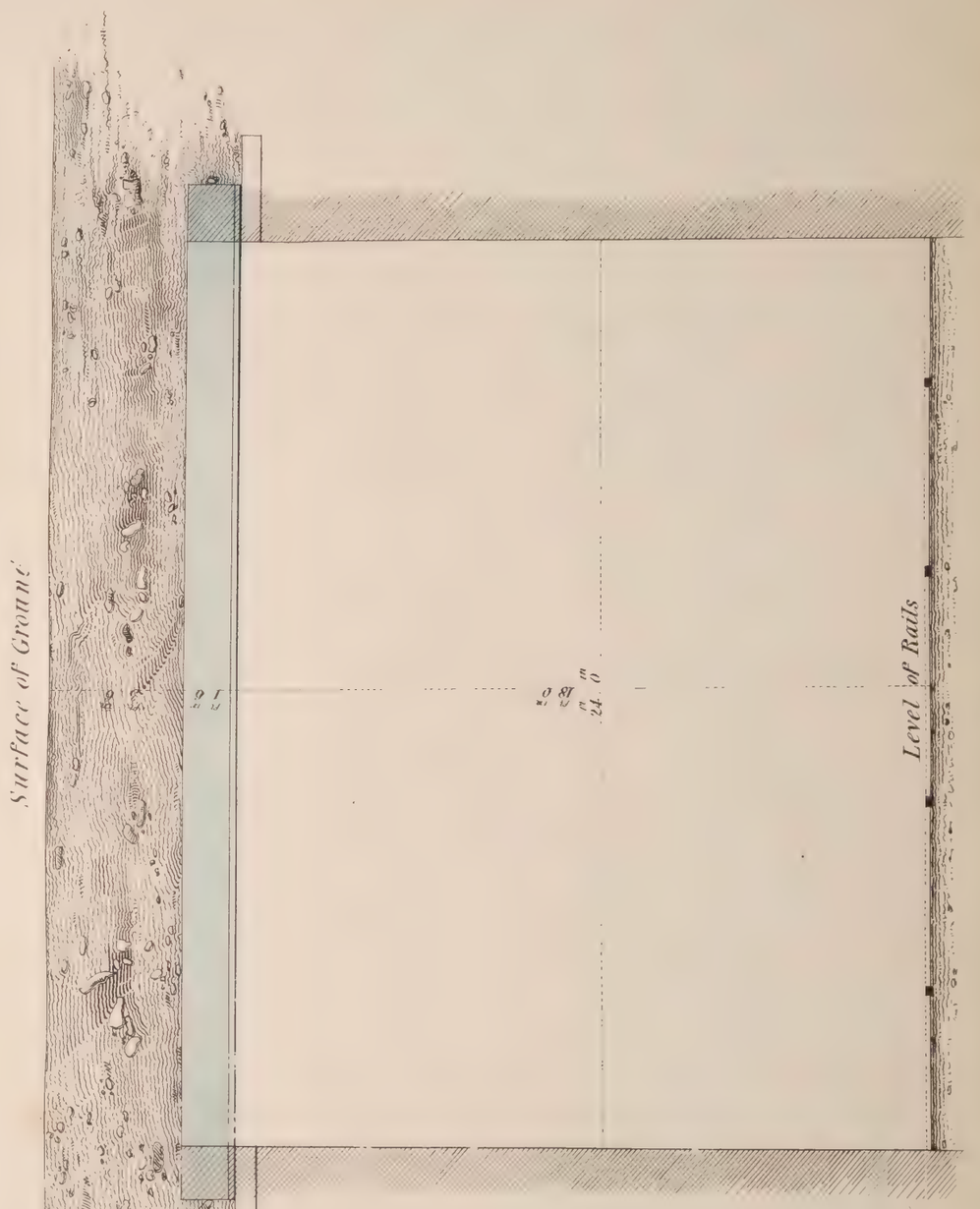
NOTE. These Cross Sections refer to the Tunnel at Croom's Hill, this being the point where the Tunnel will be nearest to the surface of the Ground. The rails will be lowered 3 feet from those as laid out in the deposited Section.

Luke James Hansard Printer.

N°394. Ordered, by The House of Commons, to be Printed, 16th June, 1846.

TRANSVERSE SECTION OF PROPOSED TUNNEL THROUGH GREENWICH PARK.





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NOTE. These Cross Sections refer to the Tunnel at Croom's Hill, this being the point where the Tunnel will be nearest to the surface of the Ground. The rails will be lowered 3 feet from those as laid out in the deposited Section.

Luke James Hansard Printer.

No. 394. Ordered, by The House of Commons, to be Printed, 16th June, 1846.

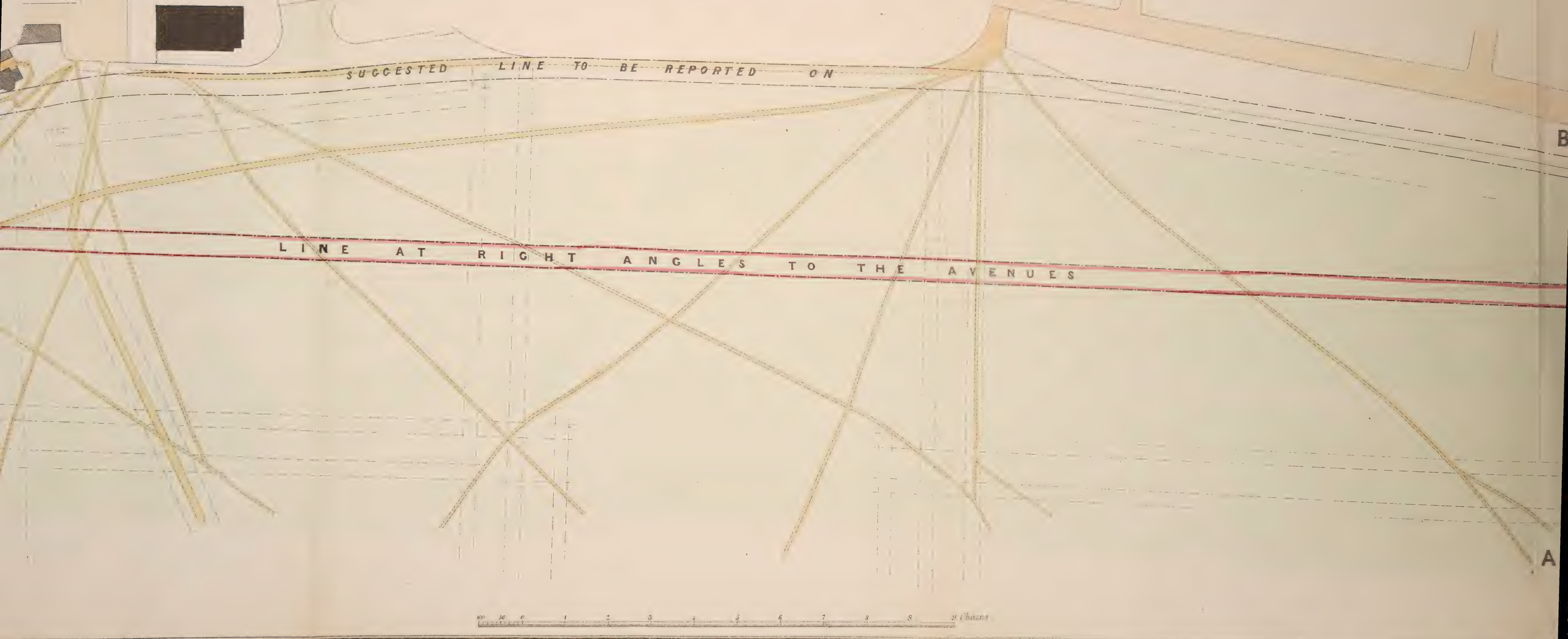
SOUTH EASTERN RAILWAY.

PLAN

of a portion of the Line through

GREENWICH PARK,

Shewing the Suggested Line at right angles to the Avenues.



Tunnel or Covered way
to extend to A 40 yds
West of Grooms Hill

Grooms Hill

Line at right angles to the Avenues

Parliamentary Line

Nº 7.

SOUTH EASTERN RAILWAY

(CHILHAM BRANCH.)

PLAN

Shewing the Line suggested through

GREENWICH PARK.

LIMIT OF DEVIATION
Covered way to extend to B 20 yards E. of Maize Hill
Slope to be planted
Slope to be planted
Maize Hill
LIMIT OF DEVIATION
6 7 8 9 10 Chains

NOTE_ *The part coloured Green East of Maize Hill shows about half the Area proposed to be added to the Park.*
The Trees on this Plan are laid down from measurement

Signed
Thos Page
14 May 1846

Nº 394. Ordered, by The House of Commons, to be Printed, 16th June, 1846.
Lond: James Harrison Printer.

CORRESPONDE

SOUTH EASTERN RAILWAY,

(CHILHAM BRANCH.)

PLAN

Shewing the Line suggested through

GREENWICH PARK.

The Royal Naval School.

T U N N E L O R C O V E R E D W A Y .

SCALE OF CHAINS.

0 1 2 3 4 5 6 7 8 9 10

GREENWICH PARK.

COPIES of Correspondence with the Commissioners of Woods and Forests, respecting the passing of a Railroad through *Greenwich Park*.

(*Mr. Hume.*)

Ordered, by The House of Commons, *to be Printed,*
16 *June* 1846.

[*Price* 8*s.* 6*d.*]

394.

Under 10 *oz.*

GREENWICH PARK.

PLANS

REFERRED TO IN THE

CORRESPONDENCE, Reports, &c., on the subject of any Railroad passing through Greenwich Park, and its probable Effects on the Royal Observatory.

Plan I. —Sketch Plan referred to in Mr. *D. Burton's* Report.

„ II. —A rough Section of the Railroad Tunnel under *Liverpool*, explanatory of Observations on its imparting Tremor.

„ III.—Plan showing the proposed Extensions of the North Kent and the South Eastern Railways.

Ordered, by The House of Commons, *to be Printed*,
10 *June* 1846.

SKETCH PLAN

referred to in

Mr D. BURTON'S REPORT.

Dated 30th April, 1846.

(No 375.) Ordered, by The House of Commons, to be Printed, 10th June, 1846.
John James Hansard, Printer.

3.

Plan

Shewing the

PROPOSED EXTENSIONS

of the

NORTH KENT

and the

SOUTH EASTERN RAILWAYS.

Standidge & Co.' lith.

No 375. Ordered, by The House of Commons, to be Printed, 10th June, 1846

Luke James Hansard, Printer

A Rough Section of the
RAILROAD TUNNEL** under **LIVERPOOL,
Explanatory of Observations on its imparting tremor.

July 1835. (Sig.d) H. M. Denham.

Vertical Scale of Feet
50
100
150
200
Wapping
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Cornwallis Street. Mercury, 44 feet directly over Rails, much agitated.
White Street
Grenville Street
Nelson Street. Mercury, 55 feet directly over Rails, agitated and could hear the train.
Great George Street
Rathbone Street
St. James's Road. Mercury, 100 feet directly over Rails, quite tranquil and could not hear the trains
Hope Street
Blackburn Place. Mercury, 85 feet directly over Rails, quite tranquil
Crabtree Lane
Bedford Street
Heath Street
Chatham Street
Vine Street
TUNNEL
Crown Street
Smithdown Lane
Lord Street
Green Lane
Wavertree Lane
Intervening medium
Solid Sandstone exclusively.
Rails lie upon 9 ft. 9 in. of Wet Marsh over Sand stone Rock.
Offset adopted to detect extent of vibration laterally on same level in open air
1 Mercury much disturbed
2 Mercury much agitated.
3 Mercury 475 feet horizontally from Rails—1 foot soil 4 ft. 6 in. marsh 5 ft. 6 in. above rock agitated.
4 Vibration very perceptible
5 Vibration perceptible
6 Mercury 942 feet horizontally from Rails—6 feet 6 in. soil above Rock as above, — vibration scarcely perceptible.
7 Mercury 1110 feet horizontally from Rails—Substratum, loose Sand 3 feet, March 9 feet 6 in. 12 ft. 6 in. above Sand stone rock, vibration exhausted

Nº 375 Ordered, by The House of Commons, to be Printed, 10th June 1846.
Luke James Hansard, Printer.

3.

Plan

Shewing the

PROPOSED EXTENSIONS

of the

NORTH KENT

and the

SOUTH EASTERN RAILWAYS.

E S S E X

SURREY

SUSSEX

RIVER THAMES

RIVER MEDWAY

ISLE OF SHEPPEY

ISLE OF THANET

STRAITS OF DOVOR

ENGLISH CHANNEL

LONDON

Southend

Nore Light

Cliff

Allhallows

Sheerness

Queenborough

Leysdown

Sheppey

Erith

Woolwich

Blackwall R.

Greenwich

Deptford

Wickham

Crayford

Dartford

Gravesend

Tilbury Ft.

Lewisham

Bexley

Swanscombe

Northfleet

Bromley

Croydon

Croydon Railway

Farnborough

Cudham

Sevenoaks

Westerham

Godstone

Horton Kirby

Eynsford

Farningham

Colham

Strood

Rochester

Chatham

Lower Halstow

Upnor

Frindsbury

Rainham

Bobbing

Milton

Newington

Sittingbourne

Whitstable

Herne Bay

Margate

North Foreland

Broad Stairs

Ramsgate

Hearne

Chislet

Monkton

Minster

Pegwell Bay

Wealdham

Burham

Aylesford

Stockbury

Boughton

Faversham

Preston

Graveney

Teynham

Canterbury

Ickham

Thanington

Chartham

Milton

Clatham

Sandwich

Worth

Deal

Walmer

Waldershare

Ringwold

Barksbourn

Godmersham

Crundell

Stalling

Silverswould

Denton

Wootton

Ivelden

Ewell

Swingfield

Chafton

Dover

Lyminge

Capel le Ferne

Hougham

Sellinge

Standford

Newington

Saltwood

Charlton

Hythe

Folkestone

Sandgate

Military Canal

Burmarsh

Appledore

New Romney

Lydd

Rye

Winchelsea

Battle

Dunge Ness

Hollingbourn

Lenham

Ulcomb

Charing

Maidstone

Allington

Teston

Yalding

Tunbridge

Medway

Edenbridge

Penshurst

Fairlight

Pembury

Brenchley

Tunbridge Wells

Cowden

East Grinstead

Hartfield

Lamberhurst

Biddenden

Cranbrook

Tenterden

Sandhurst

Rother

Mayfield

Pluckley

Headcorn

Hothfield

Kennington

Willesborough

Ashford

Kingsnorth

South Eastern Railway

London and Brighton Railway

Greenwich Railway

Croydon Railway

Maidstone Branch

Railway

Nº 375. Ordered, by The House of Commons, to be Printed, 10th June, 1846

Luke James Hansard, Printer

PLANS

REFERRED TO IN THE

CORRESPONDENCE, Reports, &c., on the subject of any Railroad passing through Greenwich Park, and its probable Effects on the Royal Observatory.

(*Mr. Hume.*)

Ordered, by The House of Commons, *to be Printed,*
10 *June* 1846.

[*Price* 1*s.*]

GREENWICH PARK.

RETURN to an Order of the Honourable The House of Commons, dated 19 May 1846;—*for*,

COPIES "of any CORRESPONDENCE between the BOARD of ADMIRALTY, the ADMIRALTY HYDROGRAPHER, and any other Officers of or connected with the ADMIRALTY since January 1834, referring directly or indirectly to any RAILROAD passing through GREENWICH PARK, within One Mile of the ROYAL OBSERVATORY; also COPIES, of any REPORTS or COMMUNICATIONS made by the ASTRONOMER ROYAL, or by any Committee, or any Private Individual, to the BOARD of ADMIRALTY, or to the ADMIRALTY HYDROGRAPHER, on the probable Effects of any Railroad passing within One Mile of the ROYAL OBSERVATORY at GREENWICH:"

"Of any REPORTS made to the ADMIRALTY, ADMIRALTY HYDROGRAPHER, or other Officers of the ADMIRALTY, by the ASTRONOMER ROYAL, by any Committee, or any Private Individual, on the Subject of EXPERIMENTS made for the purpose of ascertaining the probable Effects of any RAILROAD passing within One Mile of the ROYAL OBSERVATORY at GREENWICH."

(*Mr. Hume.*)

Ordered, by The House of Commons, *to be Printed*,
10 *June* 1846.

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PLANS.

CORRESPONDENCE, Reports, &c., referring to Railway Communication through Greenwich Park.

No. 1.

From Sir *Benjamin Stephenson* to *Charles Wood*, Esq.

Correspondence,&c., relative to the probable effects on the Royal Observatory

Office of Woods and Forests,

Sir,

Mem.—The Plans referred to in this Paper will be delivered separately as soon as ready.

12 *June* 1846.

coloured yellow. I feel confident that no objection could be raised to such a measure by the inhabitants of Greenwich; because, after heavy rains, and through a want of drainage, the water remains on the surface for several hours, and this, too, at the entrance into the Park from Croom's Hill. This inconvenience I have myself witnessed from my house during the 10 years I have lately resided at Greenwich. Should the Commissioners of his Majesty's Woods and Forests not think it indispensably necessary that the depth of 10 feet be left over the tunnel along every part of it, the tunnel may advantageously be made higher.

On the general section sent herewith, the red line will show the altered level at the west end, in order to pass under the Park instead of over it, as originally contemplated, and by which the levels will be improved, and the expense diminished.

I have, &c.

(signed) *Geo. Landmann*, Civil Engineer.

William Green, Esq.

London and Gravesend Railway Office, 17, Cornhill,
4 June 1835.

Honourable Sirs,

In reference to the conference which the deputation of the Gravesend Railway Committee were honoured with on the 22d ultimo, by your Honourable Board, I am directed to transmit herewith, for your information, the accompanying documents marked A. and B., which the Committee trust may remove the objections to the former project of passing over the Park.

The sanction of your Honourable Board is therefore solicited to the making of a tunnel under Greenwich Park, in lieu of passing over it. The accompanying copy of the engineer's letter, addressed to me, will, it is presumed, afford such information as may be necessary, in addition to his plan and section; and as the conditions imposed on the Windsor Railway Company have served as a guide in the engineer's designs, the Committee entertain a hope that your Honourable Board will grant them the same indulgence. The Committee are the more strengthened in that hope, as the projected design cannot interfere with the public recreation, or in any manner destroy the Crown property.

I am further directed to say that the Committee, anxious to afford his Majesty's Commissioners of Woods and Forests the most ample information on the subject of the present

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

communication, and to give such explanations with reference thereto as may completely satisfy their minds (should any doubt remain thereon, after the perusal of the accompanying papers), so as to ensure as early a determination on the part of the Commissioners as may be consistent with the exigency of the business depending before them,—to say that they will feel great pleasure in attending, with their engineer, any conference which his Majesty's Commissioners may be pleased to appoint for that purpose.

I have, &c.
(signed) *Wm. Green*, Secretary.

A. Plan and section of the tunnel to be carried under Greenwich Park.
B. Copy of Colonel Landmann's letter to W. Green, in reference to plan.

The Commissioners of his Majesty's
Woods and Forests.

No. 2.

No. 2.

From *Charles Wood*, Esq. to *John Pond*, Esq.

Sir, Admiralty, 19 June 1835.

I AM commanded by my Lords Commissioners of the Admiralty, to transmit to you herewith the accompanying documents, with reference to the possible influence of the transit of heavy loads, &c., through the tunnel thereby proposed to be constructed by the Gravesend Railway Company, under a part of Greenwich Park, upon the Royal Observatory, and to desire that you will report your opinion thereupon, returning the papers with your report.

I am, &c.
J. Pond, Esq., Astronomer Royal. (signed) *C. Wood.*

No. 3.

No. 3.

From *John Pond*, Esq. to *Charles Wood*, Esq.

Sir, Royal Observatory, 20 June 1835.

IN obedience to the commands of their Lordships, as transmitted to me in your letter of the 19th instant, I enclose to you my opinion respecting the Greenwich tunnel, as relating to its probable effect on the observations of the Royal Observatory.

I am, &c.
Charles Wood, Esq.
Secretary of the Admiralty. (signed) *John Pond.*

Encl. in No. 3.

Enclosure in No. 3.

REPORT to the Lords Commissioners of the Admiralty, on the subject of the Greenwich Railway, from *J. Pond*, Astronomer Royal.

NOT having had any actual experience of the degree of concussion produced by the transit of heavy carriages on railways, any opinion that I can venture to give can only be founded on conjecture.

The most important observations made at the Royal Observatory are those in which the stars are seen by reflection from a horizontal surface of mercury. It appears to me highly probable, by what I have experienced from slighter causes, that the passage of heavy carriages, even at the distance of the intended tunnel, might produce sufficient tremor on this surface to destroy the accuracy of these observations.

(signed) *John Pond.*

Royal Observatory, 20 June 1835.

No. 4.

No. 4.

From Captain *Beaufort*, R.N. to Commander *Denham*, R.N.

Sir, Admiralty, 22 June 1835.

A QUESTION of considerable importance having come before the Board, and which has been referred to me for an opinion, I should feel exceedingly obliged to you if you would try a simple experiment for me, by which my opinion would be fortified.

The case is this :—The Greenwich Railway Company wanted to be allowed

to

to carry their arches and railroad along the lower edge of Greenwich Park. This was at once refused by the Ranger, and indeed by Government, upon which the Company has submitted another proposition, viz., to go under the Park through a tunnel, and, consequently, to approach so much nearer to the Observatory, in order to have the perforation covered by the hill. In the nearest point it will be within 600 feet of the instruments, and as the most valuable of all our observations with the two great vertical circles are made by reflection from quicksilver, it has been suggested that the rapid transit of a train of waggons at the tail of a steam-carriage would cause so much tremor in the mercury as to render the observations impracticable.

But it would be childish to be guided by opinions and suggestions, when the fact can be distinctly ascertained by means of the Liverpool and Manchester Railroad, and I, therefore, want you to take your artificial mercury horizon to that railroad, and watch the contact of a star or the sun in altitude with a telescope when the train is passing at two or three different distances, till you come to the outer limit of vibration, or, in other words, to the distance at which the mercury is no longer affected.

After you have tried this on the surface, I wish you would then try the same experiment in the neigbourhood of the tunnel, as I presume that the results will be very different; and as Government is waiting to give a positive answer till I report on this part of the subject, I am sure you will do me the favour of replying as soon as you conveniently can.

I am, &c.

(signed) *F. Beaufort.*

Commander Denham, R.N.,
&c. &c.

Perhaps the alt of a spire or corner of a house, measured by telescope in the sextant, would do, if the sun or star be not favourable.

No. 5.

No. 5.

From Commander *Denham*, R.N., to Captain *Beaufort*, R.N.

Dear Sir, Liverpool, 2 July 1835.

HAVING this evening completed a series of observations on the vibratory effects of the Liverpool and Manchester Railroad, according to your desire of the 22d ult., I hasten to hand you, by the closing post, the result thereof.

I find the vibration of trains of 120 tons, at a speed of 25 miles per hour, affect the mercury as far as 942 feet laterally with the rails, on the same level, and on equal substratum; but vibration perfectly ceases at 1,110 feet; whilst directly over the tunnel, no vibration is detectable at 95 feet distance, though quite discernible at 65 feet vertical distance.

To account for the delay of my reply, I should observe, that although I found no difficulty (except weather) in ascertaining the effect contiguous to the open line of road, yet I could not profit by the usual routine of traffic intercourse, in reference to the tunnel, inasmuch that the stipulated hours completely so blended with the hours of carting-carriages and bustle, as to preclude any satisfactory result. I am, therefore, indebted to the co-operative accommodation of the Directors, who allowed trains of extra weight, and at extra speed, to pass down at night hours, when the busy hum was completely suspended.

Trusting the foregoing may be acceptable to the object of inquiry, I beg to subscribe myself,

Dear Sir,
Your's faithfully,

(signed) *H. M. Denham*, Commander.

Captain Beaufort, R.N.,
Hydrographer, Admiralty.

It is proper to remark on the above, that Commander Denham's experiments depended on observations made with a sextant, and that the limits of tremors in the mercury would be far more extensive if viewed by the high magnifying powers used with the mural circle.

F. B.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

No. 6.

No. 6.

From *Charles Wood*, Esq., to the Commissioners of Woods and Forests.

Gentlemen, Admiralty, 6 July 1835.

In reference to Sir Benjamin Stephenson's letter of the 19th ult., on the subject of the possible influence of the transit of heavy loads, &c. through the tunnel proposed to be constructed under a part of Greenwich Park, upon the Royal Observatory, I am commanded by my Lords Commissioners of the Admiralty to acquaint you, that their Lordships having referred to the Hydrographer, to the Astronomer Royal, and caused experiments to be made on the Liverpool Railway, cannot but consider that the transit of heavy loads through the proposed tunnel would most materially affect the Royal Observatory, and destroy the accuracy of the observations which are made there.

I am, &c.
(signed) *C. Wood.*

The Commissioners of Woods and Forests.

No. 7.

No. 7.

From *Charles Wood*, Esq., to the Astronomer Royal.

Sir, Admiralty, 8 January 1836.

Having laid before my Lords Commissioners of the Admiralty a letter from Mr. James Vallance, with its enclosures, on the subject of the proposed railway from Greenwich to Gravesend, I am commanded by their Lordships to transmit to you the above-mentioned letter and its enclosures, and to request you will state your opinion thereupon, returning the enclosures with your reply.

I am, &c.
(signed) *C. Wood.*

The Astronomer Royal, Greenwich.

No. 8.

No. 8.

From Sir *John Barrow*, Bart., to the Astronomer Royal.

Sir, Admiralty, 19 January 1836.

I am commanded by my Lords Commissioners of the Admiralty to transmit to you the enclosed copy of a letter from Mr. Edward Soleby, respecting the proposed London and Gravesend Railway.

I am, &c.
(signed) *J. Barrow.*

The Astronomer Royal, Greenwich.

Encl. in No. 8.

Enclosure in No. 8.

Sir, Cornhill, 18 January 1836.

Understanding that it is in contemplation to nominate (on the part of the Lords Commissioners of the Admiralty) a Commission to ascertain the effect of tremor produced by the locomotive trains on the London and Greenwich Viaduct, with a view to learn whether such tremor would affect the astronomical observations at Greenwich Observatory in the event of the Gravesend Railway being carried through the Park:—

I respectfully beg leave, as a shareholder in both these very important undertakings, through this means to suggest to their Lordships that the proposed Act of Parliament may prohibit the meeting of locomotive trains in contrary directions within the Park, by which the fourfold tremor, arising from double relative velocities, will be prevented (a point of great importance), such tremor being, at the instant of passing, eight times the vibration produced by a single train.

It may further be observed, that the rate of travelling through the Park may also be decreased, so that the tremor may, on the smooth rails, be reduced even to less than that of a waggon or omnibus on the common road.

Apologising for this intrusion, I beg to subscribe myself, Sir,

Yours, &c.
(signed) *Edward Soleby.*

Secretary, &c. Admiralty.

No. 9.

Correspondence, &c. relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

No. 9.

From Professor *Airy* to *Charles Wood*, Esq.

Royal Observatory, Greenwich,
4 February 1836.

Sir,

I HAVE the honour to acknowledge your letter of January 8th, enclosing certain memorials, two maps and an elevation, relative to the proposed London and Gravesend Railway, and conveying the commands of my Lords Commissioners of the Admiralty that I should examine and report as to the probable inconvenience to the Royal Observatory which might be produced by the railway passing through the lower part of Greenwich Park. I have also to acknowledge your letter of January 19th, enclosing the copy of a letter relating to the same matter from Mr. Edward Soleby.

I have the honour to transmit, for the consideration of my Lords Commissioners of the Admiralty, the following Report:—

The inconvenience most to be feared is the tremor of the ground produced by the rapid motion of heavy trains of carriages, and which would be particularly sensible in the observations of reflexion in a trough of mercury; which observations, for the accuracy of modern astronomy, are quite indispensable.

There appeared to be no satisfactory method of determining with any degree of certainty whether the tremor would be sensible, except by trying the effects of trains of carriages moving with considerable speed upon a railroad similar to the proposed railroad, and founded upon a similar soil.

It appears that the Greenwich Railway, as far as it is finished, is similar in its general construction to the proposed railway. At my request, therefore, a spot of ground was selected near the Greenwich Railway, at which the nature of the soil, as ascertained by boring to the depth of 25 feet, is nearly similar to that of the Park, as commonly supposed, but which I have had no means of verifying. For details, I beg to refer to Appendix (A.)

On January 25th, an apparatus was placed by me on the spot referred to, capable of showing with much delicacy the tremor in a trough of mercury; and a locomotive engine, with such a train as was considered a fair average load, was made to run with different velocities from 24 miles per hour to five miles per hour. The general result was, that with a velocity of 24 miles per hour, the tremor was barely perceptible when the train was at a distance of 1,100 feet from the mercury; and that when its distance was less than 750 feet, the tremor was so great as to prevent observations from being made. Between these distances the tremor, though sensible, was not too great to be compatible with observation. When the velocity was diminished, the tremor was much reduced. For details, I beg to refer to Appendix (B.)

From the reply to certain queries addressed by me to the Secretary of the directors of the proposed railway (for which, with the answers, I beg to refer to Appendix (C), as well as from inspection of the map furnished to me, it appears that the smallest distance of the proposed line from the nearest angle of the Royal Observatory would be 850 feet, or from the observing rooms 900 feet; and thus a train of carriages would be within the limits of disturbance while moving through a space of 1,200 feet, or, if passing at the rate of 24 miles per hour, during nearly 40 seconds of time.

From the reply to Question 4, Appendix (C.), it appears that this might take place six times or eight times in the evening; at which time only observations by reflexion can commonly be made.

I beg now to observe that the number of observations by reflexion made in one evening seldom amounts to 10; and that any one of these observations, or all of them, may, without injury (though with a small inconvenience) be accelerated or retarded 20 seconds; and, moreover, that this has been done uniformly in the observations of that class made under my direction at Cambridge. Also I beg to remark, that if the trains ran with perfect regularity, the train which interfered with the observation of a star on one evening could not interfere with the observation of the same star on the next evening.

In reply to Query 3, Appendix (C.), it was stated that there would be no difficulty on the part of the directors of the railroad in checking or stopping a train at a concerted signal from the Royal Observatory.

After consideration of all these points, I have no difficulty in stating my opinion that the tremor caused by the carriages on the railroad might sometimes,

Correspondence, &c. relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

but very rarely, cause a trifling annoyance; but that it would not cause anything like serious interruption of the business of the Royal Observatory, and that it is hardly worth consideration. But, with the power of checking a train by signal, I conceive that all inconvenience produced by the railroad would be completely removed.

I do not deem it necessary, after expressing this opinion, to notice further the suggestion contained in the letter of Mr. Edward Soleby, than to state that it might probably be found least annoying that two opposite trains should pass through the Park at the same time.

A small annoyance might, perhaps be felt at times from the noise of the steam-engines; but I think it too trifling to merit further notice.

I beg to submit to my Lords Commissioners of the Admiralty that, in case of a Bill for the making of a railway being offered for the sanction of the Government, it would be desirable distinctly to prescribe the distance of the railway from the Royal Observatory; and also to reserve to the Astronomer Royal the power of stopping trains by signals, twice at least, each for one minute of time, in the course of each evening.

I return the memorials, the maps and the elevations sent for my inspection.

I have, &c.

(signed) *G. B. Airy.*

Charles Wood, Esq.,
Secretary to the Board of Admiralty.

Encl. in No. 9.

Enclosure in No. 9.

Appendix (A).

Strata bored through in the meadow, called the Glebe, near the Surrey Canal, about 200 feet south of the Greenwich Railway, and nearly in the line drawn from the place of experiment perpendicular to the direction of the railway.

	Ft.	In.		Ft.	In.
Surface earth	1	6	River Gravel	2	0
Gravel	6	0	Chalk marl	1	0
Sand	1	0	Coarse river-sand	3	0
Gravel	4	0	Fine river-sand	3	6
Coarse flinty gravel	3	0		25	0

Part of the above boring was made in my presence, and nearly the whole was closely examined by me. The gravel, in general, closely resembles all that I have seen in Greenwich Park.

(signed) *G. B. Airy.*

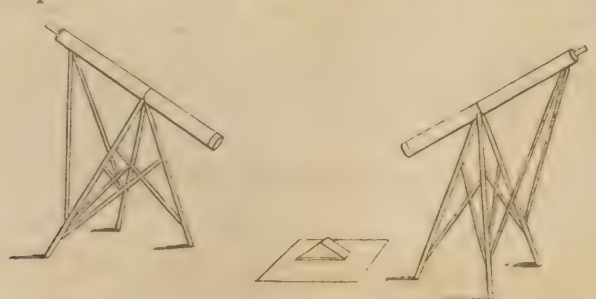
Appendix (B).

Experiments made at the end of the Glebe Meadow on the 25th of January 1836.

The turf and the soft earth were removed from the surface, leaving a hole big enough for a large flagstone, which was laid immediately on the gravel. The distance of the hole from the railway was very nearly 500 feet.

Upon the flagstone was placed a small tray of quicksilver (about 6 inches by 5), covered by a glass roof.

Two detached telescopes belonging to the Royal Observatory were furnished with eye-pieces, carrying micrometer wires. They were placed on opposite sides of the mercury, with the object-glasses of both directed towards the mercury in such a manner that the wires in the focus of one telescope could be seen distinctly by reflexon from the mercury with the other telescope.



The sketch above may serve to give some idea of the instrumental arrangements.

When

Correspondence,&c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

When the approach of a train was perceived, an observer (in all instances, except three, the Astronomer Royal), applied his eye to one telescope, while a friend noted, with a watch in his hand, the time of passing certain signal-posts, as well as the times of disturbance of the image, as indicated by the observer. Another friend sometimes noticed the place of the train at the times of disturbance.

A signal-post was erected on the parapet of the railroad, at the point nearest to the mercury tray, and 1,000 feet was measured from it in each direction on the railroad; and at the end of these lines, other signals were placed. This line of 2,000 feet, with the observation of the time, gave an estimation of the velocity; and the subdivision of the space or of the time, gave an indication of the distance from the mercury at the instant of any particular disturbance.

The number of carriages attached to the locomotive engine and tender was six.

In the quickest runs, the line of 2,000 feet was passed in something less than a minute of time. With this velocity, the runs were repeated six times. In all (with small irregularities), a disturbance in the clearness of the image was perceptible, when the train was very near the distant signal-posts (1,100 feet from the mercury), and the image was almost lost from the violence of the agitation when the train was about half-way between the central signal-post and the extreme signal-post (700 feet from the mercury). When the train was passing the central signal-post (500 feet from the mercury), the mercury was in such agitation, that it was impossible to know whether there ought to be any object visible at all.

With smaller velocities, the tremor appeared to be sensible at nearly the same distance; but it was so much reduced, that the wires were seen pretty well when the train, moving with a velocity between five and ten miles per hour, was not more distant than 500 feet.

There were present, besides the Astronomer Royal, the following gentlemen: Mr. Francis Baily, Mr. Sheepshanks, Mr. Whewell, Mr. Main.

(signed) *G. B. Airy.*

APPENDIX (C.)

COPY of a LETTER from the Secretary of the London and Gravesend Railway Company to the Astronomer Royal.

London and Greenwich Railway Office, 76, Cornhill,
28 January 1836.

Sir,

IN answer to your inquiries, under date of 26th instant, I am desired by the Directors to state in reply:—

Question.	*Answer.*
1. What is the least distance from the Royal Observatory to the proposed line?	1. That the least distance of the proposed line to the Royal Observatory will be 850 feet.
2. With what speed is it proposed to pass through the Park, and within what limits (of greatest and least speed), could this be altered to suit the convenience of the Royal Observatory?	2. For so short a distance, any speed that may suit the convenience of the Astronomer Royal will be adopted.
3. If at the time of making an important observation, a train of carriages should be entering the Park, would it suit the arrangements of the railroad to allow its speed to be checked, or to allow the train to be stopped entirely for one minute of time, upon signal given from the Royal Observatory?	3. Upon a given signal from the Royal Observatory, the speed of the engine and train can be checked or stopped at any time.
4. How late in the evening is it intended that carriages should run on the railroad, and how often in each hour of the evening?	4. Perhaps once every hour each way, until eight or nine o'clock in the evening; and it may be desirable, occasionally, to pass through the Park at a later hour.

I have further the honour herewith to send a map of the Park, with the intended line marked upon it. I am also desired by the Committee to say, that should you require further explanation on any point connected with the experiments in question, they will be most ready to meet your wishes, and to receive any suggestions you may think proper to make.

I have, &c.

(signed) *William Green,*
Secretary.

Addressed,
G. B. Airy, Esq., Astronomer Royal,
&c. &c. &c.

No. 10.

No. 10.

THE substance of the Astronomer Royal's objection to the proposed Gravesend Railway is, that the tremor produced on the ground by the motion of heavy trains will

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will be particularly sensible at the Royal Observatory, and will, consequently, interfere with and obstruct the taking of certain observations by reflection.

To obviate which, he proposes that in the Bill intended to be brought into Parliament, the distance of the railway from the Observatory should be prescribed; and that power should be reserved to the Astronomer Royal, by signal, to stop any trains, for one minute of time, as often in the evening as he shall see necessary.

But might not the proposed line of railway through Greenwich Park be fixed at such a distance from the Observatory as to render the tremor insensible at the Observatory, and so that the passage of the trains would in nowise interfere with the observations?

The least distance of the Railway, as proposed, will be 850 feet.—*See* Appendix (C.)

The Astronomer Royal, referring to the experiments made, states, that the tremor was barely perceptible at the distance of 1,100 feet; but within 750 feet was so great as to prevent observations from being made; and that between those two distances, the tremor, though sensible, was not too great to be compatible with observations, and that the tremor was much reduced by the diminution of the velocity.

Suppose, then, 1,000 feet would be such a distance as would place the Observatory out of the reach of the effect of the trains, all that need be done will be to prescribe that distance in the Bill; but if the line be allowed to approach within any perceptible distance, then it will be necessary that a clause as suggested should be framed, to place the passage of the trains through the Park at certain times in the evening under the control and check of the Astronomer Royal.

10 February 1836. (signed) *Charles Jones.*

No. 11.

No. 11.

From Sir *John Barrow*, Bart., to *James Vallance*, Esq.

Sir, Admiralty, 11 February 1836.

In reference to the memorial transmitted in your letter of the 7th ultimo, respecting the projected railway from Greenwich to Gravesend, I am commanded by my Lords Commissioners of the Admiralty to inquire whether the railway may not, without detriment, be carried out a greater distance from the Royal Observatory.

I am, &c.

James Vallance, Esq.,
6, Earl-street.

(signed) *J. Barrow.*

No. 12.

No. 12.

From Sir *John Barrow*, Bart., to the Astronomer Royal.

Sir, Admiralty, 11 February 1836.

With reference to your letter of the 4th instant, respecting the proposed railway from Greenwich to Gravesend, I am commanded by my Lords Commissioners of the Admiralty to inquire, whether removing the railway to a greater distance from the Royal Observatory would render unnecessary any regulations for checking the speed of the trains on it, or stopping them altogether for a time, and, if so, what is the least distance that would effect this object.

I am, &c.

The Astronomer Royal. (signed) *J. Barrow.*

No. 13.

No. 13.

From Professor *Airy*, to Sir *John Barrow*, Bart.

Royal Observatory, Greenwich,
Sir, 12 February 1836.

I HAVE the honour to acknowledge your letter of the 11th instant, respecting the possibility of avoiding the necessity for any regulations of the speed of carriages on the proposed London and Gravesend Railway, and to reply as follows:

Supposing the circumstances of soil and the capability of transmitting tremors exactly the same in Greenwich Park and at the place of experiment, then I conceive that the removal of the railway to a distance greater by 100 feet would effectually prevent the perception of any inconvenience from the motion of carriages on the railway: a tremor might possibly be sensible, but it would not be greater than that caused by the steps of persons on the ground of the neighbouring parts of the Park or the courts of the Observatory, or not greater than the tremor of the grounds which is caused by the action of the wind upon the walls. At the distance proposed in the map laid before me, the tremor would be something greater, but not much greater. But I conceive that the uncertainty, as to the difference of effects arising from unascertained differences of soil, may be so great as to render any exact statement wholly impossible; and I cannot form the smallest conjecture, whether the tremor would probably be greater in the Park or in the place of experiment.

In conclusion, therefore, I can only state my belief, that if the soils are exactly similar, and if the railway were removed 100 feet further, no annoyance whatever would be felt. But I am also of opinion, that if the soils are similar, the railroad might be carried on the line as proposed, without causing any annoyance of the smallest importance; and it is only as an additional security against unforeseen troubles that I would wish the railway to be further removed. With the greater distance, I think, that as far as can be predicted in such uncertain circumstances, there would be no need to possess any control over the motions of the railroad carriages: with the smaller distance, also, it is probable that it would be quite unnecessary, though, as a matter of security, I should be glad to retain it if practicable.

I have, &c.
Sir John Barrow, (signed) *G. B. Airy.*
Secretary to the Admiralty.

No. 14.

No. 14.

From *John P. Boileau*, Jun., Esq., to Sir *John Barrow*, Bart.

London and Gravesend Railway Office, 76, Cornhill,
Sir, 12 February 1836.

I AM directed by the Court of Directors to acknowledge the honour of your letter of 4th instant, and in reply to state, that Colonel Landmann, the Company's engineer, is of opinion that it would not interfere with the construction of the railroad to remove it to 50 feet greater distance from the Observatory; but, in so doing, their Lordships would perceive, by the plans laid before them, that it must approximate in the same proportion to other public buildings.

I am also desired to observe, that the Court of Directors, desirous to adopt every measure required for the security of the Observatory, and persuaded that the Lords Commissioners must look favourably upon an undertaking designed to secure so speedy and direct a communication with the great dockyards and arsenals of the country, would long ere this have proposed the honour of waiting by deputation on the Lords of the Admiralty, but that they considered it more respectful to await a reply to their memorial of the 7th January, and to add that they have now appointed Colonel Landmann, Mr. J. P. Boileau, and Mr. William Borradaile, as a deputation to attend with this letter, and offer any explanations which may be desired.

I have, &c.
Sir John Barrow, Bart., &c. &c. (signed) *John P. Boileau*, Jun.
Chairman.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

No. 15.

No. 15.

From Sir *Benjamin Stephenson* to Captain *F. Beaufort*, R. N.

Office of Woods and Forests,
Sir, 13 February 1836.

I BEG leave to transmit, for your information, the enclosed copy of a letter addressed to the First Commissioner of this Board by the Chairman of the Committee of Management of the Gravesend Railway Company.

I have, &c.

Captain F. Beaufort, R. N. &c. &c. (signed) *B. Stephenson.*

Encl. in No. 15.

Enclosure in No. 15.

My Lord, 29, Parliament-street, 11 February 1836.

I AM directed by the Committee of Management of the Gravesend Railway Company to state to your Lordship, that they only yesterday evening received the answer of the Commissioners of Woods and Forests, dated the 8th instant, to their memorial for permission to pass through Greenwich Park.

I am also directed to express to your Lordship the great regret felt by the Committee of Management at the decision which has been adopted by the Commissioners of Woods and Forests, and further to express their hope that it will not be taken as any disrespect to your Lordship and the Commissioners if the Committee, having made all their necessary arrangements, still propose to have their petition presented to the House of Commons, and to proceed with their Bill, as they confidently trust in Committee to be able to show such great public advantages to be derived from this undertaking, as may induce your Lordship and the Commissioners of Woods and Forests to entertain more favourable views towards them.

I have, &c.

The Right Hon. Viscount Duncannon, &c. &c. &c. (signed) *John P. Boileau*, Jun. Chairman.

No. 16.

No. 16.

From *Henry Hawkesworth*, Esq., to Sir *John Barrow*, Bart.

Office of Woods and Forests,
Sir, 26 February 1836.

THE Committee of the Gravesend Railroad having stated to this Board that their engineer has staked out a line for a proposed viaduct through Greenwich Park for inspection, I am directed to request that you will have the kindness to move the Honourable Board of Admiralty, at their early convenience, to appoint such officers as they may think proper, to attend with two officers named by this department, for the purpose of viewing and reporting upon the line which has been so staked out.

I have, &c.,

Sir J. Barrow, Bart. &c. &c. (signed) *Henry Hawkesworth.*

No. 17.

No. 17.

From *Isaac L. Goldsmid*, Esq., to the Secretary of the Board of Admiralty.

St. John's Lodge, Regent's Park,
Sir, 4 August 1840.

ON behalf of the Provisional Committee for forming the Company for the intended railway from London to Chatham, I beg to forward to you, as Secretary of the Honourable Board of Admiralty, a sheet of the Trigonometrical Survey of England, on which the line of this railway is traced, so that its relative position with the adjacent country may be understood; also a printed statement, and general sketch, map, and diagram section of the line. These are accompanied by two plans of the railway, where that work affects property belonging to or under the control and direction of the Board of Admiralty; one of the plans and sections relating to Blackheath and its vicinity, including the Royal Observatory, the other plan and section relating to the neighbourhood of

of Chatham and the proposed new river lines or wharfs, or quayages, on the shores of the river Medway.

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I am further instructed to state officially, that the proper Parliamentary plans and sections were lodged, and the prescribed notices given, on or before the 1st day of March last, in the manner and at the times and places prescribed by the Standing Orders in Parliament. These plans and sections have been considered to be on too small a scale to enable the Board of Admiralty and their officers to form a judgment or opinion of the mode in which their property or arrangements would be affected by the proposed railway, and their engineer, Mr. Charles Vignoles, of Trafalgar-square, has been ordered to prepare the accompanying plans and sections, and has been instructed to be prepared to furnish to the officers of the Board of Admiralty such further detailed information in the engineer's department as may be called for, and for that purpose he will attend to any request for his attendance on the officers of the Board.

As the Standing Orders of both Houses of Parliament allow a re-lodgment of plans and sections in the month of November next, containing any variations, additions, enlargements, extensions or deviations from the plans lodged on or before the 1st March last, it would be satisfactory to have an early intimation from the Board of any alterations that might be required by the Board, supposing there does not exist any substantial objection to the general principles of the measure, as in the event of any alteration in detail being requisite, the same might be embodied in time for the November lodgment.

On the subject of the legal arrangements, and the requisite clauses in the Bill, for the due regulation of any agreements or provisions that may be required to be observed, the solicitor for the measure, Mr. William Stephens, 30, Bedford-row, will be instructed to communicate with the solicitor of the Board.

Under any circumstances, on behalf of the Provisional Committee, I beg to represent, that as a public measure of great importance to the community and to the Government, we trust the London and Chatham Railway will be found worthy of the patronage and support of the Board.

I have, &c.

(signed) *Isaac. L. Goldsmid,*
Chairman of the Provisional Committee.

To the Secretary of the Board of Admiralty,
&c. &c., Whitehall.

No. 18.

No. 18.

From Sir *John Barrow*, Bart., to *Isaac L. Goldsmid*, Esq.

Sir, Admiralty, 28 November 1840.

In reference to your letter of the 4th August last, I am commanded by my Lords Commissioners of the Admiralty to acquaint you, as follows:

First. With respect to the floating bridge proposed to be established between the terminus of the railway and the Chatham shore, My Lords have no objection generally to the propositions contained in the letter from Mr. Vignoles, the railway engineer, dated 20th instant, and addressed to Captain Brandreth, R. E.; their Lordships, however, desire that a clause should be introduced into the Bill, requiring that the spit of land opposite the Chatham shore, and shown in the plan A. compressed between a yellow line and the river, should be removed, agreeably to the mode suggested in the second paragraph of Mr. Vignole's letter, and which plan is lodged in this office, and signed by Captain Brandreth and Mr. Vignoles.

Secondly. My Lords object to any jetty or quay being projected beyond high-water mark, unless a reasonable prospect can be shown that the quay will ultimately be extended in the direction of the green line shown in the plan A. and the consent of the Ordnance be obtained to carry the said line in front of the Ordnance-wharf, to the extent shown on the same plan.

Thirdly. My Lords object to the proposed inclined planes beyond high-water mark; in lieu of which they do not object to a channel being formed by

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dredging up to the wharf at high-water mark, a plan of which must be submitted for their approval.

Fourthly. My Lords have no objection to the railway passing to the southward of the Royal Observatory, provided it does not approach the building within half a mile, that being the distance to which it was originally promised to restrict it, which restriction their Lordships most distinctly desire to be enforced.

Lastly. Their Lordships desire that none of the works approved by them shall be commenced until the working plans have been approved by them.

I have, &c.

(signed) *John Barrow.*

Isaac L. Goldsmid, Esq., Provisional Chairman
of the London and Chatham Railway.

No. 19.

No. 19.

Isaac L. Goldsmid, Esq. to Sir *John Barrow*, Bart.

St. John's Lodge, Regent's Park,
4 January 1841.

Sir,

I HAD the honour of receiving your letter of the 28th November, acquainting me, in reply to my previous communication of the 4th August, of the opinion of the Lords Commissioners of the Admiralty on the subject of the London and Chatham Railway, and with respect to the floating bridge or steam ferry across the Medway, between the railway terminus and the Chatham shore.

Immediately on receipt of the same, the railway engineer, Mr. Vignoles, was directed by the Provisional Committee to revise the plans about to be lodged, according to the Standing Orders of Parliament, so far as to lay down on the same the design for taking powers in the Bill about to be applied for in the ensuing Session, for removing the spit of land opposite the Chatham shore in the manner pointed out in the letter of Mr. Vignoles to Captain Brandreth, dated 20th November last, and shown on the plan A. thereto appended, as comprised between a yellow line and the river; and for forming a new river shore in the mode suggested in the second paragraph of Mr. Vignole's letter, and which plan is now lodged in the Admiralty, and signed by Captain Brandreth and Mr. Vignoles.

The engineer was further instructed to remove from the plan about to be lodged, the design for any quays or jetties projecting beyond the present quayage at high-water mark; and also to alter his intended project for inclined planes on the present surface of the shore beyond high-water mark; and in place thereof to lay down plans for ferry channels to be dredged up to the wharf at high-water with ferry-docks to remove the boats from the line of river wharfage.

The plans thus altered by the engineer were deposited, on the 30th November last, with the clerks of the peace for the county of Kent, and for the city of Rochester; and also with the clerks of the several parishes of Frindsbury, of Chatham, and of St. Nicholas in the city of Rochester; and an official notice of the mode in which it is proposed to take powers in the manner above stated, was left with you on the 31st of December, signed by Mr. William Stephens, the solicitor for the Bill intended to be applied for, and otherwise filled up, as pointed out by the Standing Orders of Parliament, to which notice was attached a copy of the plan of the steam ferry or floating bridge across the Medway so lodged, showing the spit of marsh land as proposed to be cut off, also the ferry channels and ferry docks. Two lines of ferry or floating bridge are laid down to allow time to consider which will be most drainable to be ultimately adopted, as stated in Mr. Vignoles's of the 20th November, the promoters reserving their choice only until the Bill is brought into the Committee of the House of Commons.

To this plan I beg respectfully to refer you, at the same time requesting permission for Mr. Vignoles to give any further explanation to Captain Brandreth that may be necessary. The solicitor has been desired to prepare clauses to be introduced

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introduced into the Bill, in accordance with the preceding arrangements, and containing such stipulations as may be necessary to give due effect to them; and the same will be transmitted to you previous to the Bill being brought into the House of Commons to be submitted for the approval of the Lords of the Admiralty.

In respect of the passing of the railway to the southward of the Royal Observatory in Greenwich Park, I am particularly directed by the Provisional Committee to assure you that it is their wish and intention to keep the line half a mile from that building, such being the distance to which it was originally undertaken to restrict the approach, and clauses shall be inserted in the Bill to that effect. I beg, however, to observe, that, in consequence of not having received your letter of the 28th November in sufficient time to allow of the plans being altered, the line of railway remains laid down a trifle within the stipulated distance of half a mile; but the powers of deviating the course of the railway to be authorized by the Act will enable the engineer to keep the works when under execution to the conditions imposed, and which may be enforced by such stipulations in this and in other respects as the Lords of the Admiralty may direct.

Under these circumstances I trust that the promoters of the railway will have the official consent and approval of their Lordships to the principle of this undertaking, and to the particular mode of carrying the same out, so far as the property and rights under the control and conservation of the Admiralty may be affected.

I have, &c.
(signed) *Isaac L. Goldsmid,*
Chairman of the Provisional Committee.

Sir John Barrow, Bart., &c. &c.
Secretary to the Admiralty.

No. 20.

No. 20.

From Sir *John Barrow,* Bart., to *Isaac L. Goldsmid,* Esq.

Sir, 20 January 1841.

Having laid your letter of the 4th instant, on the subject of the London and Chatham Railway, before my Lords Commissioners of the Admiralty, I am commanded to acquaint you that their Lordships see no objection to the principle on which this railway is proposed to be undertaken, or to the mode of carrying the same into execution, according to the final plans and stipulations deposited in the office of Admiralty, subject however to the introduction into the Bill to be brought into Parliament, of the usual clause for the preservation of the rights and property of the Crown, and for the maintaining the control and jurisdiction of their Lordships on the shores of the Medway, below high-water mark, as conservators of the navigation of the kingdom.

I am, &c.
(signed) *John Barrow.*

Isaac L. Goldsmid, Esq.
St. John's Lodge, Regent's-park.

No. 21.

No. 21.

From *Isaac L. Goldsmid,* Esq., to the Secretary of the Admiralty.

Sir, Hall of Commerce, City, 13 January 1845.

In reply to the communication under date of the 4th instant, which you did me the honour to make in reference to the proposed London, Chatham and North Kent Railway, I have to reply seriatim as follows:—

1. The plan and section of the Blackwall Railway have already been sent into the Admiralty with the other maps; but it is not intended to carry the line of the railway, or to construct works beyond the line of high-water of the river Thames, as the Blackwall Branch has been thrown out to meet the traffic of the London and Blackwall Railway, and

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and it will rest with the directors of that establishment to take steps to connect themselves with this proposed branch thrown out to meet them.

2. The plans and elevations of the proposed bridge over the River Medway are now transmitted.
3. There are also transmitted the plan and section of the proposed quay at Chatham.
4. There are further transmitted a plan and section of the proposed mode of crossing the Swale, into the Isle of Sheppey, by a drawbridge, which will afford a clear opening of 60 feet in width, for the passage of vessels, which drawbridge will be arranged to work upon exactly the same principle as the drawbridge to be erected across the river Adeir, at Little Hampton, on the Brighton and Chichester Railway.
5. In respect of the proposed works at Sheerness, Faversham Creek, Pegwell Bay and Dover, I have the honour to state, that it is not intended to erect constructions of any kind at either of those places beyond high-water mark.

The engineer of the London, Chatham and North Kent Railway, has been directed to wait upon the hydrographer of the Admiralty, to add any explanation respecting the plans and sections which may be required.

I have, &c.
(signed) *Isaac L. Goldsmid*,
Chairman of the Provisional Committee.

To the Secretary of the Admiralty.

Encl. in No. 21.

Enclosure in No. 21.

Office of the London, Chatham and North Kent Railway,
Sir, Hall of Commerce, London, 26 December 1844.

On behalf of the Provisional Committee of the London, Chatham and North Kent Railway, I have the honour to lay before you, for the information of the Board of Admiralty, a statement of the course and details of this intended line of railway, as drawn up by the engineer of the Company, for the information of the Board of Trade, and the committee venture to hope that the merits of the scheme will be found to be such as to obtain for them the favourable consideration of your Board.

This railway presents the most direct communication between the important military and naval arsenals and depôts of Woolwich, Chatham, Sheerness and Canterbury, and between those stations and the metropolis; and the facilities of extending the line to Margate, Ramsgate, Sandwich, Deal, Walmer and the garrison and port of Dover, constitute it an undertaking of the first national importance.

The line has been laid out with a view of bringing it as near as possible to the population, and thereby affording the greatest amount of local accommodation to the district through which it passes. A reference to the Ordnance map sent herewith, will show that the railway not only passes through an almost continued series of populous towns and villages, all intimately connected with the metropolis, but affords facilities to and for the country on each side, accommodating a population calculated at 400,000, at present almost wholly excluded from any direct railway communication with London; and while thus effecting these great national and local objects, the deterioration of ornamental and residents' property has been generally avoided.

The mode of passing the Royal Observatory in Greenwich Park, has been adopted in order to comply with the requirements of the Board of Admiralty, as pointed out in your letter, dated 28th November 1840, which I had the honour to receive as one of the Provisional Committee formed in that year, for carrying out substantially the present line as far as Chatham, in reference to which letter I beg to state, that the present railway in no part approaches the Royal Observatory nearer than 1,000 yards.

By the course taken in proceeding to and passing Woolwich, great destruction of property is avoided, and the line is carried round the north base of Shooter's-hill, and advanced into a great circle of population requiring accommodation in that district.

It is proposed to carry the line between the Royal Artillery Barrack Field and Woolwich Common (a length of half a mile) through the present haha, by sinking it to a sufficient depth, so as to avoid disturbing, even for a time, the levels of Woolwich Common, which upon the former occasion was found to be objectionable. With retaining walls on one or both sides of the excavation, the railway will be passed across the common without touching the exercise ground, and it may be covered or tunnelled over to any extent the Board of Ordnance may deem it necessary. By this means the railway will not present the least obstruction, either to the Barrack Field or to Woolwich Common, and it will be entirely concealed.

The Medway is intended to be crossed by a bridge, which it has been proposed to build in co-operation

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co-operation with the Rochester Bridgewardens, and the plan has been favourably received by those parties. It has long been considered necessary to rebuild the present Rochester-bridge, and this occasion presents a favourable opportunity for constructing one bridge for both purposes; considerable expense will be saved to the Bridgewardens, and the impediments to the navigation from a separate bridge will be avoided; stone piers and large arches are intended, and by introducing a solid screen of suitable height in the manner proposed by the engineer, the carriage-way will be amply protected from all danger.

The line will, by this means, be carried into and through the towns of Rochester and Chatham, affording the greatest possible amount of convenience and accommodation to those important places.

It is proposed to pass Chatham by keeping along the strand, between low-water mark and the backs of the houses, as far as the Sun Hotel. This embankment will be filled up solid, from the beach to the level of the wharfs, with a quay-wall next the river; on this embankment, the railway will be carried as a viaduct, from 12 to 14 feet high above the quay level, which mode of construction will afford the proprietors of the river-side premises full access to the water, and will indeed give them quays they do not now possess. This mode of passing along the strand, with the exact line for the quay-wall, remains to be officially approved of by the Board of Admiralty; but it is hoped that it will, upon consideration, be favourably viewed by the Government Boards, as it has been generally by the parties interested in that part of the shore of the river.

Considerable pains have been taken to avoid encroaching on the Ordnance property at the Chatham Gun Wharf on the one hand, and cutting across the military and parochial burial-ground on the other; and after getting over the military road, the railway is tunnelled for 1,000 yards under the great field or exercise ground, commonly known as "Chatham Lines," east of the citadel and fortifications at Brompton, and quite clear of the glacis.

The branch to Sheerness commences at Sittingbourne. From this place the line falls with easy gradients to the marshes, and will be carried perfectly horizontal to the sea-shore at Sheerness, terminating in the large vacant space, about midway between the dock-yard gates and the Royal Hotel in Mile Town. There are scarcely any works on this branch; the only peculiar engineering feature being the unavoidable drawbridge across the Swale, at the crossing of that creek into the Isle of Sheppey, close to the King's Ferry.

It is proposed that the Blackwall branch shall leave the main line at the west corner of Woolwich Common, and terminate on the banks of the Thames, opposite the Brunswick Pier at Blackwall; but neither of these branches is an essential part of the undertaking, should they not be approved of by the Government Boards.

The engineer has been directed to present to your Board plans and sections of the portions of the intended work within the jurisdiction of the Admiralty, and he has been instructed to attend the officers to whom the matter may be referred, to give any further explanations that may be required.

I beg leave to add, that the proper plans, sections and books of reference, as prescribed by the Standing Orders of Parliament, have been duly lodged, with a view to an application for an Act in the next Session; and the Committee hope that the measure will meet with the approval of the Board of Admiralty.

The full amount of the subscription required for this purpose by the Standing Orders, has been entered into by respectable and substantial parties, and the deposits thereon have been duly paid up.

I have, &c.
(signed) *Isaac L. Goldsmid,*
Chairman of the Provisional Committee.

To Sir John Barrow, Bart.,
&c. &c. &c.

No. 22.

No. 22.

From Sir *John Barrow*, Bart., to Sir *Isaac L. Goldsmid.*

Admiralty, 15 January 1845.

Sir,

Having laid before my Lords Commissioners of the Admiralty your letter of the 13th instant, with its several enclosed plans and sections in reference to the proposed London, Chatham and North Kent Railway, I am commanded to signify their Lordships' assent to the course of this railway as far as concerns the Royal Observatory, the bridge across the Medway, the quay at Chatham, and the viaduct over the Swale, provided the proper controlling Admiralty clause be duly inserted in the Bill, and provided the position of the terminus at Sheerness be left to their Lordships' decision.

I am, &c.
(signed) *J. Barrow.*

Sir Isaac L. Goldsmid,
Hall of Commerce, London.

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No. 23.

No. 23.

From Professor *Airy*, to the Hon. *Sidney Herbert*.

Royal Observatory, Greenwich,
15 January 1845.

Sir,

I HAVE the honour to acquaint you that I had this morning an interview with Mr. Robert Stephenson, engineer of the proposed North Kent Railway, who called on me for the purpose of explaining the proposed course of the line through Greenwich Park, and of learning the extent of the objections which might apply to that line, as affecting the observations made at the Royal Observatory by the tremor produced by the carriages on the railway.

It appears from the plans laid before me that it is proposed to carry the railway through the Park in a tunnel, of which the crown will be several feet below the surface of the ground; the smallest distance of the railway from the front of the Royal Observatory being about 255 yards.

In reference to this subject, I have the honour to state that in the month of January 1836, when it was proposed to carry a railway through the Park upon arches or a colonnade, I made a series of experiments for determining the distance to which the tremor produced by the passage of an ordinary train upon such a railway might be sensible in the usual observations of the Royal Observatory, and that I found that it was perceptible at the distance of about 330 yards. These experiments were made at the command of the Lords Commissioners of the Admiralty, and a report on them was duly transmitted by me to their Lordships. But I do not consider these experiments as at all applicable to the present case, the construction of the railway being very different.

I have also understood that experiments were made several years since by Captain Denham, R. N., on the tremor produced by a railway train in a tunnel in or near to Liverpool, but I consider these experiments also as inapplicable to a tunnel in Greenwich Park, the nature of the ground being totally different.

I would therefore submit for the consideration of my Lords, whether they may be pleased to direct that I make experiments under circumstances which I may judge more analogous to these of the proposed line; such experiments to be reported to their Lordships, and if they shall judge it necessary, to be laid before the Board of Visitors of the Royal Observatory.

I have, &c.

The Honourable Sidney Herbert,
&c. &c. &c.
Secretary to the Admiralty.

(signed) *G. B. Airy.*

No. 24.

No. 24.

From Sir *John Barrow*, Bart., to Professor *Airy*.

Sir,

Admiralty, 18 January 1845.

HAVING laid before my Lords Commissioners of the Admiralty your letter of the 15th instant, on the subject of the effect which will be produced by the North Kent Railway as regards the observations made at the Royal Observatory, I am commanded by their Lordships to acquaint you, that having already decided that no railway shall pass through Greenwich Park, nor between the Royal Observatory and the Thames, and as their assent has been given to another projected line of railway which is to pass to the southward of the Park, their Lordships will not give you the trouble of the experiments which you propose.

I have, &c.

Professor Airy,
Royal Observatory, Greenwich.

(signed) *J. Barrow.*

No. 25.

No. 25.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

No. 25.

From Captain *Hamilton*, R.N., to Sir *George Clerk*, Bart.

Sir, 31 May 1845.

I AM commanded by my Lords Commissioners of the Admiralty to transmit to you herewith copy of a memorial from the vicar, churchwardens and other parochial officers of Greenwich, respecting the Bill to enable the South Eastern Railway Company to extend the London and Greenwich Railway to Crooms-hill, Greenwich, as also a copy of a minute of the hydrographer of the Admiralty thereon, and I am to acquaint you that my Lords entirely concur with the hydrographer in opinion that the Bill should not be allowed to pass.

I have, &c.

Right Hon. Sir George Clerk, Bart., &c. &c. &c. *W. A. B. Hamilton.*
Board of Trade.

Enclosure in No. 25.

MINUTE of Captain Beaufort, R.N.

Encl. in No. 25.

It is well known that the passage which I have marked with red ink in the third page shows the true object of this railway, and I would therefore submit that Government should at once give the parties notice that their Bill should not pass, and thus avoid the chance of their underhand scheme, as well as save the town of Greenwich from being cut to pieces.

To the Right Honourable and Honourable the Lords Commissioners of the Admiralty.

The humble MEMORIAL of the Vicar, Churchwardens and other Parochial Officers of the Town and Parish of Greenwich, in the County of Kent,

Showeth,

THAT your memorialists desire to draw the attention of your honourable Board to a Bill now before the House of Commons, intituled, "A Bill to enable the South Eastern Railway Company to widen certain parts of the London and Greenwich Railway, and to extend the same Railway to Crooms-hill, Greenwich," by which it is proposed to take power to cross some of the principal highways, streets and thoroughfares of the town of Greenwich, by means of cuttings or trenches; that is to say, the highway of London-street by a cutting five feet in depth, Royal-hill by a cutting 13 feet in depth, and Crooms-hill by a cutting 20 feet in depth.

That it appears, by the plans and sections of such proposed railway, it is intended to raise the present roadway of London-street (the principal entrance to the town from the metropolis), nine feet, and the present roadway of Royal-hill three feet, so as to enable the said railway to pass under such roadways.

That, in order to raise such highways to the heights proposed, it will be found necessary to alter and raise the ground of those highways some distance on each side of the said intended cuttings, as well as the adjoining roads of Prince of Orange-lane, South-street and Greenwich-road, in consequence of which it will become requisite to have steps either from the carriage-roads to the footways, or from the footways to the houses adjoining.

That the cuttings so proposed, and the raising of the said roads and highways, as above mentioned, will be seriously injurious to the adjoining houses and other adjacent property, and will prove in the highest degree detrimental to the interest of the inhabitants generally, but more particularly to those in trade, in consequence of the said railway cutting through the parish, and thereby severing the tradesmen from the opulent families residing on and near Blackheath and other parts southward of the said railway.

That the said proposed cuttings across Crooms-hill, Royal-hill and London-street would, if carried into effect, present great difficulties in the way of an effectual drainage of the town, and render the works necessary to effect such drainage, if not absolutely impracticable, certainly much more difficult and expensive than they otherwise would be.

That the proposed extension of the London and Greenwich Railway to Crooms-hill, Greenwich, is part of the projected scheme of the South Eastern Railway Company for making a line of railway from London, through Greenwich and the Royal Park, Woolwich, and Gravesend, to Chilham, near Canterbury; but the Standing Orders Committee of the House of Commons having thrown out the said Company's Bill for making a railway from Hungerford-bridge to Chilham, with a branch to Maize-hill, Greenwich, which was intended to continue their line from Greenwich-park to Woolwich, the object the said Company had in extending the London and Greenwich Railway to Crooms-hill appears to have been defeated, and their persevering in their scheme for extending the London and Greenwich Railway about 430 yards from its present terminus at Greenwich can only be with a hope of their ultimately succeeding in some future Session of Parliament to obtain power to continue such railway through the Royal Park to Woolwich and the northern parts of Kent.

That by the plans and schemes of the South Eastern Railway Company, as well as of the London, Chatham and North Kent Railway Company (whose Bill is also now before the

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

House of Commons), it appears to be quite practicable to make an efficient line of railway communication from Hungerford-bridge and the Bricklayers' Arms to Woolwich, Gravesend, Chatham and North Kent, without cutting through and injuring the town of Greenwich, or passing through the Royal Park, as contemplated by the said Bill for extending the London and Greenwich Railway.

That your honourable Board will perceive, on reference to the annexed plans, the line laid down by the South Eastern Company for extending the Greenwich Railway to Crooms-hill, and that a branch of the proposed line from Hungerford-bridge to Chilham was intended to be continued to Maize-hill, Greenwich, so as to have formed a junction with their other line at Crooms-hill, by carrying the railway through Greenwich-park.

That your memorialists are most anxious that the Royal Park should be kept free, as it has hitherto been, from the approach of any railway, which would not only deface and blemish its present beauty, but would also, in all probability, occasion the removal of the Royal Observatory therefrom, a consequence which your memorialists would greatly deplore, and are therefore most desirous of averting.

Your memorialists, therefore, most earnestly and respectfully pray that your honourable Board will be pleased to interfere to prevent the extension of the said Greenwich Railway to Crooms-hill, so near as that spot is to the Royal Observatory, and that you will furthermore interfere by declaring your determination to prevent such railway from being carried under, through or over the Royal Park of Greenwich.

And your memorialists will ever pray.

W. A. Soames, Vicar of Greenwich.
Wm. Neale, *Wm. Clark*, } Churchwardens.
George Reeve, *Prior Purvis*, M.D., *David Dennant*, *Jos. Morris*, } Governors and Directors.

Greenwich, 21 May 1845.

E. W. James, Vestry Clerk.

No. 26.

No. 26.

From Captain *Hamilton*, R.N., to the Rev. *W. A. Soames*.

Sir, Admiralty, 6 June 1845.

HAVING laid before my Lords Commissioners of the Admiralty your memorial of the 21st May, on behalf of the inhabitants of the town of Greenwich, praying their Lordships' interference to prevent the extension of the Greenwich Railway to Crooms-hill, I am commanded by their Lordships to acquaint you that they disapprove of the proposed extension, and will not give their consent to the Bill for that purpose.

I am, &c.
(signed) *W. A. B. Hamilton.*

Rev. W. A. Soames, Vicar of Greenwich.

No. 27.

No. 27.

From *John P. Fearon*, Esq., to the Secretary to the Board of Admiralty.

South Eastern Railway Office,
35A, Great George-street, Westminster,
19 January 1846.

Sir,

I HAVE the honour of transmitting herewith, on behalf of the South Eastern Railway Company, a memorial to the Lords of the Admiralty in relation to that portion of the projects of the Company, to be presented to Parliament in the ensuing Session, which relates to the passage of the proposed North Kent line, as promoted by this Company, in a tunnel under Greenwich Park.

The Directors are aware that difficulties have existed in the minds of their Lordships with reference to this plan, from an apprehension that the railway so placed would occasion vibration to an extent which would affect the instruments in the Royal Observatory in Greenwich Park.

Having been made aware of this difficulty, the Directors requested Mr. Robert Stephenson to institute a series of experiments which might bring this important question to the test.

I take the liberty of enclosing a copy of Mr. Stephenson's report on this subject, and of requesting that you will be good enough to lay it, with the other documents, before the Lords of the Admiralty.

The

The Directors of the Company are quite aware of the importance of this question, and I am instructed on their part to state that if it should be shown that, by the execution of the work through Greenwich Park any detriment whatever would arise to so essential a branch of the public service as the Royal Observatory, they would not for a moment press the matter further; but having satisfied themselves, by such experiments as it has been in their power to institute, that no grounds for such apprehension exist, they consider it only right on their part to bring the subject again under the attention of their Lordships, and most respectfully to request that some further inquiry may be made.

With this view, I am instructed to ask of their Lordships that if the experiments made by Mr. Stephenson should not be considered satisfactory, they will be good enough, at the expense in all things of this Company, to direct other experiments to be made, by such parties as they may think proper to appoint.

The Directors of this Company venture to submit this question to their Lordships as one involving the daily convenience of a very large population at Woolwich and in that neighbourhood. There cannot be a doubt that, in an engineering point of view, the line under Greenwich Park is the best line, and the Directors are satisfied that if it can be shown that the apprehensions as to the interference with the Observatory are unfounded, their Lordships will be anxious to throw no impediment in the way of a work which is viewed with the greatest interest by the inhabitants of the district which it is intended to serve.

I have, &c.

(signed) *John P. Fearon.*

The Secretary to the Board of Admiralty.

Enclosure in No. 27.

To the Directors of the South Eastern Company.

Gentlemen,

In accordance with your request, I have seriously considered whether the line of railway to North Kent may pass through Greenwich Park without producing any injurious effect upon the instruments of the Astronomer Royal in the Observatory: and at what distance and in what manner the line of railway may be safely constructed.

In order to render my conclusion perfectly intelligible, I shall first describe to you the manner in which I proposed to take the line from the Greenwich Railway through the Park, and the peculiar circumstances which here appear.

I find it necessary to make an alteration in the level of the terminus of the Greenwich Railway for a distance of 20 chains, that the line may pass under the streets between it and the Park.

The depth of cutting at the entrance of the Park is 20 feet, and increases to 27 and 29 feet under the two avenues at Maize-hill, and at the termination of the Park to 38 feet.

The distance the line passes from the Observatory is 255 yards, and at a depth of 128 feet below the foot of the building, being 25 feet under the surface of the ground.

These features are shown in the plan, sections and cross-sections accompanying this report.

The material here met with would principally consist of gravel.

Having thus briefly stated the circumstances peculiar to this case, I will proceed at once to state to you the means which I have adopted to arrive at correct judgment, whether the distance and depth are sufficient, and what construction of railway would be the best.

I have referred to a series of experiments tried by Mr. Dockray, the resident engineer of the London and Birmingham Railway, to ascertain the alleged vibration of retaining walls on the Euston Square Extension of the Birmingham Railway, during the passing of the trains; from the report of which I take the following passages:—

> "In order to ascertain the amount of vibration, I procured a box about two feet square, the bottom and top of which were made of plate-glass. The bottom plate was covered with a thin stratum of fine emery, and the box was placed upon the adjoining wall to one line. During the passing of the trains, no disturbance of the particles of the emery took place.
>
> "This was tried at various times, and always with the same result, and so far the experiments were conclusive, that no vibration took place.
>
> "As I was not satisfied with the delicacy of the test, I mentioned the subject to Mr. R. Stephenson, and he advised me to try a plate filled with quicksilver. This experiment was tried under the same circumstances as the previous ones, and on the passage of the trains, the surface of the quicksilver was slightly disturbed, but it was found to be equally so by the passage of a cab, when the plate was placed upon the footpath of the adjoining street. When the plate was placed in one of the houses close to the walls no vibration took place."

These experiments, though important, referred only to trains without engines, and to where the line was bounded by retaining walls. I have therefore had a series of experiments tried with

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

with the same description of instruments, which I consider of extreme delicacy, with circumstances more varied, and more especially applicable to the peculiar case now under discussion.

These experiments are given in the appended table, to which I will now draw your attention.

The numbers of the experiments, each of them, include three or four observations of the effect produced by the same trains, at various distances from the line of railway, and that due to the peculiarity of construction and depth of cutting.

Experiments No. 1 to 11 were taken at points opposite to the covered way and cutting, shown on the accompanying cross sections Nos. 1 and 2. The former being a tunnel, 21 feet 4 inches in height, with a covering, 9 feet 3 inches; and the latter, a cutting 24 feet in depth. The circumstances of the construction of both being therefore applicable to the line of railway through Greenwich Park.

Experiments 11 and 12 were tried, where the extreme depth did not exceed 5 feet, in order the more fully to test the effect produced by the vibrations of the air.

The description of trains varied from the heaviest goods-train, (2 engines and 40 waggons, or about 250 tons,) to the lightest and most rapid mail-train.

Before entering upon the observations for each of these circumstances, I will more specifically describe the instrument by which they were made. It consisted of a circular cup, highly glazed, with a flat bottom, which was completely covered with quicksilver; this was kept free from oxidation by occasional filtering, so that, by observing a fixed reflection on its surface, an infinitely slight movement could be detected.

The vessel was firmly bedded in the ground, which was hard from the frost, and therefore peculiarly adapted for communicating the vibrations produced by the train, and the quicksilver was completely sheltered from the wind by the high sides of the vessel.

The eye of the observer was constantly rested, as the trains only passed at intervals of about half an hour, and he was changed from one position to another, in order to give a comparative idea of the amount of vibration in the different positions.

In the first six experiments, an instrument was fixed at the edge of the bank of cutting, shown on cross section No. 2, and the first four on the tunnel, and in all but two showed very considerable agitation during the passing of the train for a length of time, evidently varying inversely as the velocity of the train. In one, (No. 6,) much less vibration was indicated, which is fully accounted for by the lightness of the train.

In the other *no* vibration was observed. This is a *singular* exception, though the fact is strongly corroborated, by very little vibration being indicated on the tunnel.

There was considerable vibration produced by vehicles passing rapidly on the road over the tunnel, though much less than by the majority of the trains.

At a distance of 245 yards from the centre of the railway at the cutting, and 220 yards at the tunnel, *no* vibration was indicated. Neither could any be observed at a distance of 125 yards at the cutting, while there was an extremely delicate indication at the distance of 100 yards, both from the tunnel and open cutting, which was very evidently increased as the instrument was moved to 75 and 50 yards from the centre of the railway.

These results are shown with singular consistency in the first seven experiments.

The following three experiments are highly interesting, as they tend to prove, that in the interior of a building there is less effect produced by the passing of trains than in the open fields, and also, that an effect will be produced at a greater distance in the open cutting than over the tunnel, where the instrument is so elevated as to be affected by the vibration of the air.

I will now draw your attention to the 11 and 12 experiments, which I tried, where the railway is nearly on a level with the surrounding surface, in order that the full effect of the vibration of the atmosphere might be appreciated.

I had also observed, that when the engine makes a deep booming sound by the vibration of the air in the chimney, a very decided effect is produced on windows in the neighbouring houses, so much so, that I have known the engine-house windows to be broken by it, and I therefore wished to ascertain the effect of it upon the quicksilver in a house, at a considerable distance (200 yards); from the line at this distance, an extremely slight indication of vibration was observed, while at 50 yards, there was considerably more than had been produced, either when the instrument was placed on the tunnel or on the bank of the cutting.

When this peculiar sound was not produced, there was not the slightest indication of vibration at 200 yards, and very little at 50 yards.

The material at this point on the London and Birmingham Railway is clay.

After a careful consideration of these points, I conclude, that while it is probable that the vibration produced by the motion of passing trains, might be (in extreme cases) transmitted through the medium of the atmosphere, so as to be detected with the most delicate instrument as far as the Observatory, there is not the remotest possibility of this being the case, if the railway be made in tunnel or covered way. As, under these circumstances, the indications at 100 yards were scarcely perceptible at 125 yards, there was none, though the instrument was placed only at 10 or 12 feet above the level of the rails; neither was there any in the interior of a house at 75 yards, while the Observatory is 255 yards from the line of railway, and 128 feet above it.

I therefore still propose to carry the line through the Park, in the same position as it was originally designed, in a covered way or tunnel, constructed of the best material for preventing the communication of the vibration produced by the motion of the passing trains.

I remain, Gentlemen,

Your obedient servant,

Westminster, January 1846. *Robert Stephenson.*

Number of Experiments.	Position where Observation was made.	Vibration indicated by Mercury.	Continuance of Vibration.	Description of Train, &c.
1st.	Edge of bank of cutting 24	very considerable	about 18 seconds	mail train, one engine, with 5 or 6 carriages.
,,	245 yards from cutting	none	-	- ditto - - ditto.
,,	On tunnel	very considerable	about 20 seconds	- ditto - - ditto.
,,	220 yards from tunnel	none	-	- ditto - - ditto.
2d.	Edge of bank of cutting	very considerable	about 18 seconds	1. 0. P. M. down train. One engine, with 5 or 6 carriages.
,,	245 yards from cutting	none	-	- ditto - - ditto.
,,	On tunnel	very considerable	about 20 seconds	- ditto - - ditto.
,,	220 yards from cutting	none	-	- ditto - - ditto.
3d.	Edge of bank of cutting	very considerable	about 30 seconds	goods train, two engines, with 40 waggons.
,,	125 yards from cutting	none	-	- ditto - - ditto.
,,	On tunnel	very considerable	about 20 seconds	- ditto - - ditto.
,,	100 yards from cutting	extremely slight	- ditto	- ditto - - ditto.
4th.	Edge of banks of cutting	none	-	10. 0. A. M. up. One engine, with 4 or 5 carriages.
,,	125 yards from cutting	- ditto	-	- ditto - - ditto.
,,	On tunnel	very little	about 20 seconds	- ditto - - ditto.
,,	100 yards from cutting	extremely slight; scarcely perceptible	- ditto	- ditto - - ditto.
5th.	Edge of bank of cutting	very considerable	- ditto	- - - Two engines, with 30 empty waggons.
,,	50 yards from cutting	little	- ditto	- - - - ditto - - ditto.
,,	100 yards from cutting	extremely slight	- ditto	- - - - ditto - - ditto.
6th.	Edge of bank of cutting	little	-	- - - Ballast engine, with few waggons.
,,	50 yards from cutting	very little	-	- - - - ditto - - ditto.
7th.	75 yards from edge of bank	very slight	about 18 seconds	3. 0. P. M. down train. One engine, with 5 or 6 carriages.
,,	125 yards from edge of bank	scarcely perceptible	- ditto	- - - - ditto - - ditto.
,,	100 yards from edge of bank	extremely slight	-	- - - - ditto - - ditto.
8th.	On stone window-sill of house, about 70 yards N. W. of bank	none	-	3. 30. P. M. down train. One engine, with about 6 carriages.
,,	On offset of bookcase standing firmly on floor in house, 50 yards N. W. of railway end of tunnel.	- ditto	-	- - - - ditto - - ditto.
9th.	On stone window-sill of house, about 70 yards N. W. of bank	- ditto	-	special train down.
,,	On offset of bookcase standing firmly on floor in house, 50 yards N. W. of railway, near end of tunnel.	- ditto	-	- ditto.
10th.	On stone window-sill of house, about 70 yards N. W. of bank	very slight	15 seconds	Aylesbury train, 2. 30. P. M. up. One engine with about 6 carriages.
,,	On offset of bookcase standing firmly on floor in house, 50 yards N. W. of railway, near end of tunnel.	none	-	- ditto - - ditto.
11th.	In Chalk Farm Tavern, 200 yards from line; room on first floor facing railway; Mercury placed on a firm table near window.	extremely slight	30 seconds	Train arriving slowly. Two engines, deep booming sound from chimney of engine.
,,	House at 50 yards; placed on a table, near window, facing railway.	very considerable	50 seconds	- ditto - - ditto.
12th.	In Chalk Farm Tavern, 200 yards from line, room on first floor, facing railway; Mercury placed on a firm table near window.	none	-	5. 0. P. M. down train. One engine, 4 carriages.
,,	House at 50 yards; placed on a table, near window, facing railway.	little	20 seconds	- ditto - - ditto.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

No. 28.

No. 28.

From Captain *Hamilton*, R. N., to *J. P. Fearon*, Esq.

Sir, Admiralty, 4 February 1846.

I AM commanded by my Lords Commissioners of the Admiralty to desire you will inform the South Eastern Railway Company, distinctly and finally, that under no circumstances whatever will their Lordships permit a railway of any description to be carried through or under Greenwich Park.

(signed) *W. A. B. Hamilton.*

J. P. Fearon, Esq., Solicitor,
35, Great George-street.

No. 29.

No. 29.

From the Chairman and Deputy Chairman of the South Eastern Railway Company, to the Lords Commissioners of the Admiralty.

South-Eastern Railway Office,
35 A, Great George-street, Westminster,
13 February 1846.

My Lords,

REFERRING to the communications which have been recently made to your Right Honourable Board, on the part of the South Eastern Railway Company, relative to their project for a line of railway to pass through Greenwich Park, in a tunnel, and to the letter from your Secretary, under date of the 4th instant, we take the liberty of again requesting the consideration of the subject by your Lordships, on the following grounds: —

It is understood that the objection which has been raised to the project, is based on an apprehension that the passage of trains through such tunnel would occasion vibration to the instruments in the Royal Observatory.

If it should be shown that such apprehension is well founded, the Directors of this Company would not for a moment further press the subject.

But it appears, from careful experiments made by Mr. Robert Stephenson, a copy of whose report has been placed before your Lordships, that there is no ground for such apprehension. Mr. Stephenson considers it as positively demonstrated that no vibration can ensue.

The experiments made have not been shown to have been considered on erroneous principles, nor have the conclusions drawn from them been shaken by any other evidence. It does not appear that any experiments have been made on the part of your Right Honourable Board to test the accuracy of the results brought out by Mr. Stephenson.

The Directors of this Company cannot believe, that if it be the fact that no inconvenience would arise to the public service by the adoption of the line in question, your Lordships would refuse your assent to a work of so much public utility.

We venture, therefore, on the part of the South Eastern Company, to request that before the determination of your Right Honourable Board shall be finally given, you will cause experiments to be made, under the direction of the Astronomer Royal, in order to ascertain the facts on your own behalf; and we beg leave, on the part of the Company, to offer to pay the expenses of such investigation.

We have, &c.

(signed) *Torrington*, } Chairman and Deputy Chairman of the
J. MacGregor, } South Eastern Railway Company.

The Right Hon. the Lords Commissioners
of the Admiralty.

No. 30.

No. 30.

From Captain *Hamilton*, R. N., to Viscount *Torrington*.

My Lord, Admiralty, 10 February 1846.

HAVING laid before my Lords Commissioners of the Admiralty your Lordship's letter of the 13th instant, I am commanded to acquaint you, that from

from a series of experiments made under their Lordships' directions, they are satisfied that any tunnel for railway carriages passing within 1,200 feet of the Royal Observatory would affect the observations which are made there by reflection; and I have therefore to repeat the answer given, by their Lordships' commands, on the 4th instant, in a letter to the solicitor of the Company, in which he was desired to inform the Company, finally and fully, that under no circumstances whatever will the Admiralty permit a railway of any description to be carried through or under Greenwich Park.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

I am, &c.
(signed) *W. A. B. Hamilton.*

Viscount Torrington, South Eastern Railway Office,
35, Great George-street.

No. 31.

No. 31.

From Mr. *E. W. James* to the Lords Commissioners of the Admiralty.

My Lords and Gentlemen, Greenwich, 26 February 1846.

I AM directed by the churchwardens, overseers and governors and directors of the parish and town of Greenwich respectfully to draw the attention of your Lordships to a Bill lately introduced into Parliament by the South Eastern Railway Company, intituled, "A Bill to enable the South Eastern Railway Company to make a Railway from the London and Greenwich Railway, to join the South Eastern, Canterbury, Ramsgate and Margate Railway, in the Parish of Chilham, in the County of Kent," whereby, as appears from the plans deposited with the clerk of the peace and parish clerks, it is proposed to continue the present Greenwich Railway through the town of Greenwich, by crossing five of the principal thoroughfares, one of which, that of Crooms-hill, it is proposed to cross by a cutting 20 feet deep, and thence to proceed through the Royal Park by means of a tunnel or cutting.

The vestry of this parish having had the honour to submit to your Lordships, in a memorial, dated the 20th of May last, the serious objections entertained by the inhabitants to this measure, which is precisely the same as that introduced by the South Eastern Company to the House of Commons in the last Session of Parliament; and having been favoured with a reply, dated the 6th of June last, stating that your Lordships disapproved of the proposed extension of the Greenwich Railway, and would not consent to the Bill; and, further, as it appears from a letter dated the 28th of January 1845, addressed to the Earl of Dalhousie, then President of the Board of Trade, by the Right honourable Sidney Herbert, at that time Secretary to your Lordships (a copy of which letter is in the possession of the parochial authorities of Greenwich), that your Lordships' Board "had on such satisfactory grounds decided that no railway should pass between the Royal Observatory, in Greenwich Park, and the river, and had so often repeated that decision to various applicants, that it could not be too peremptorily stated, nor too generally known." The churchwardens, overseers, and governors and directors (with these assurances before them), trust they may be excused for again troubling your Lordships on this subject, by requesting to be informed whether they may continue to rely on the refusal of your Lordships to the Bill in question, so far as it relates to the passing through the town of Greenwich and the Royal Park.

I have, &c.
(signed) *E. W. James*, Vestry Clerk, &c.

To the Right hon. the
Lords Commissioners of the Admiralty.

No. 32.

No. 32.

From the Right Hon. *H. T. L. Corry* to Captain *Johnson*, R. N.

Sir, Admiralty, 14 March 1846.

I AM commanded by my Lords Commissioners of the Admiralty to signify their direction to you to confer with the hydrographer of the Admiralty on certain

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

certain experiments for determining at what distance a railway can affect delicate magnetic instruments.

I am, &c.
(signed) *H. Corry.*

Captain Johnson, R.N.,
Superintendent of Compasses.

No. 33.

No. 33.

From Captain *E. J. Johnson*, R.N., to the Right Hon. *H. T. L. Corry.*

Her Majesty's Ship "Myrmidon," Greenhithe,
16 March 1846.

Sir,

I HAVE the honour to acknowledge the receipt of your letter directing me to confer with the hydrographer relative to experiments for ascertaining the distance at which railways will affect delicate magnetic instruments, and I shall take the earliest opportunity of doing so on my return from this place.

I have, &c.
(signed) *E. J. Johnson*, Captain, R.N.

The Right hon. H. L. Corry, M.P.,
&c. &c. &c., Admiralty.

No. 34.

No. 34.

From Professor *Airy*, to the Right Hon. *H. T. Lowry Corry.*

Royal Observatory, Greenwich,
19 March 1846.

Sir,

REFERRING to the communications which I have had the honour to hold with the Earl of Ellenborough and Sir George Cockburn respecting the injury which might be done to the Royal Observatory by the carrying of railways near to it, as affecting the observations by the tremor which passing trains would produce in the ground, I beg leave herewith to transmit to you an account of the observations which I have made in the neighbourhood of the Kensal Green tunnel, and I request permission to add the following remarks on the general subject:—

It appears that the tremor produced by a train in an open cutting is sensible to the distance of about 1,700 feet. The distance, as found by experiments made in 1836, on a railway carried by arches upon a soil of character more nearly resembling that of Greenwich Park is about 1,100 feet. In both instances, the tremor noticed at those distances was the smallest that could be perceived with the best astronomical means, and was such as the ground, in frequented places, is very seldom free from.

Any railway, therefore, which passes on the south side of Greenwich Park, may at once be permitted, as producing no discernible effect on the Royal Observatory.

A railway passing within the Park at the distance of about 860 feet north of the Observatory, as proposed by Mr. R. Stephenson, would produce a sensible effect.

The following considerations seem necessary to enable my Lords Commissioners of the Admiralty to appreciate justly the importance of this effect.

The tremor in question would not produce any effect whatever upon chronometers, upon transit observations, upon direct circle observations, upon equatorial observations, or, in fact, upon any class of observations but one, namely, observations by reflection in quicksilver. This class of observations is very important, but at the same time it is, in number, very limited. On a fine evening, I think it sufficient to secure six observations of this class; in general the number is smaller. The number might be made much greater, if it were thought necessary to observe many stars in succession by reflection. And even if no stars whatever could be observed by reflection, there is an apparatus in use (of which we have an efficient specimen at the Royal Observatory) for observing the wires of the circle telescope by reflection, which can be used at any

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

any arbitrary moment, and upon which, in fact, the principal reliance for this determination is placed at some observatories. Seeing, therefore, that the class of observations affected by the railway disturbance is very limited, that only a small proportion of the observations of that class would be affected (for as the utmost duration of the effect is one minute and a quarter, if trains ran every quarter of an hour, only one-twelfth part of these observations would be affected), and that any interruption may be supplied either by observations of other stars, or by observations with the instrument to which I have alluded, I cannot say that any injury would be done to the Observatory, or any inconvenience so serious as to merit to be weighed against great official or public convenience, although a little inconvenience would sometimes be felt.

It appears, however, from the experiments, that this inconvenience, whatever its amount may be, would be very much diminished if the railway passed through a tunnel (with even a slight covering of earth) instead of an open cutting or other open construction. In the event, therefore, of a railway being carried through the Park, it is to be desired that it may be tunneled, and this consideration induces me to offer the following remarks.

Excepting in the receipt of Mr. R. Stephenson's tunnel plan, I have had no communication with the railway companies; but I understand that the competing line (the North Kent) proposes to leave the Greenwich Railway at Deptford, to pass through or under Blackheath, and to pass through or under the upper part of Woolwich Common. As regards the town and dock-yard of Woolwich, this line, I conceive, would be practically useless. Not a single passenger would go on this railway from Greenwich to the town or dock-yard of Woolwich, and very few from London. The population of Woolwich is now increasing very fast, and in a very few years a direct railway connecting Woolwich town with Greenwich and London will be imperatively required.

When this state of things arrives, it may not be so easy for any department of the Government to direct the course of a railway as it is at present. I apprehend that, as regards the pecuniary convenience to the railway company, and the general convenience to the streets of Greenwich, it would be best to carry on the Greenwich Railway at its present elevation, to the great disfigurement of the Park and great inconvenience to the Royal Observatory.

At present, the Board of Admiralty can command any terms. And when once a railway is tunnelled through the Park, it will be impossible for the railway company either to disfigure the Park, or to give the extreme of possible annoyances to the Royal Observatory by opening the cutting or by raising the level of the rails.

In laying these considerations before my Lords, I have to solicit their Lordships' indulgence.

I have, &c.

The Right hon. H. T. Lowry Corry,
Secretary to the Admiralty.

(signed) *G. B. Airy.*

Enclosure in No. 34.

Encl. in No. 34.

Abstract of Experiments made to determine the Distance to which the Tremor is sensible that is produced by the Passage of a Train on the London and Birmingham Railway in and near to the Kensal-green Tunnel. By Professor Airy. Dated 19 March 1846.

The Kensal-green tunnel was selected for these experiments on account of its resemblance, in regard to shallowness of covering, to the tunnel proposed by Mr. R. Stephenson to pass through Greenwich Park, the greatest thickness of the covering of earth being about six feet, and the least thickness one or two feet. It differs from it in regard of length, being only about 320 yards long, and in the nature of the soil, which is heavy London clay.

From the fence of the carriage-road, where it passes nearly over the centre of the tunnel, I measured 260 yards northward, and fixed on the point so determined for the place of experiment. Its distance from the centre of the railway would probably be about 830 feet; the distance proposed by Mr. R. Stephenson from the circle room of the Royal Observatory to the centre of the proposed tunnel in Greenwich Park is 13 chains, or 858 feet.

The turf and soft soil were dug away, and a wooden pedestal was planted on the hard clay, on which was placed a trough of quicksilver covered by a glass shade. Two telescopes were so placed that both looked downwards into the quicksilver, so that an observer, by looking down one could see the field-bar of the other, by reflection in the quicksilver. In the field-bar of the longer telescope (a five-feet telescope) were fixed two very fine cobwebs, about 20″ apart; these were viewed by means of a 30-inch telescope. When the ground

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

was perfectly still, and other circumstances favourable, every roughness upon these cobwebs was most distinctly visible in the second telescope, but an inconceivably small tremor of the ground caused the two wires to be blurred together and to disappear.

The turf was cut away, so that the legs of the telescope-stands were planted in the firm soil. This caution, as well as the scrupulous cleaning of the quicksilver, received partial attention on the first day, and most careful attention on the second. The observer sat on a stool, and was perfectly unmoved during the observations. The assistant, who, at signal, read a watch and made entries in a memorandum book, was at the distance of 20 to 30 feet.

The telescope observations were made entirely by myself.

The weight and estimated speeds of the trains have been furnished to me by the Secretary of the London and Birmingham Railway.

In estimating roughly the distances of the train at the beginning and end of the observed tremor, it is to be remarked, that the line of the railway is somewhat curved, the place of observation being within its concavity.

1846, February 28, afternoon.—Mercury not well cleaned, and telescopes not perfectly well planted. A slight wind, which, in spite of every effort to prevent it, shook the telescopes. The ground was in a perpetual state of agitation; I know not whether from the shake produced by the telescopes, &c., or from the passing of road carriages. The sky extremely dull, so that there was great difficulty in seeing the wires. Circumstances generally unfavourable.

Approximate Hour and Minute.	Number of Carriages in the Train.	Weight of Train, including Engine and Tender.	Estimated Speed per Hour.	Observed Duration of Tremor.	Space described by the Train during the perceptible Tremor.	Distance of Train from the Mercury at beginning and end of perceptible Tremor.	REMARKS.
H. M.		*Tons.*	*Miles.*	*Seconds.*	*Feet.*	*Feet.*	
3 36	12	75	30	65	2,900	1,500	Tremor a little diminished while the train was in the tunnel.
4 3	7	50	30	61	2,700	1,400	
4 13	6	45	42	44	2,700	1,400	Tremor considerably diminished in the tunnel.
4 27	12	68	28	48	2,000	1,100	The wires sometimes visible while the train was in the tunnel.
4 32	- Ballast train -			60	- -	- -	The wires coarsely visible while the train was in the tunnel.

1846, March 9, forenoon.—Mercury well cleaned; not a breath of wind; telescopes perfectly well planted; ground generally quiet; sky reasonably bright; the wires seen with great beauty and distinctness; and during a part of the observations, the image of the sun was visible in the field, and was very well seen; every circumstance most favourable.

Approximate Hour and Minute.	Number of Carriages in the Train.	Weight of Train, including Engine and Tender.	Estimated Speed per Hour.	Observed Duration of Tremor.	Space described by the Train during the perceptible Motion.	Distance of Train from the Mercury at beginning and end of perceptible Tremor.	REMARKS.
H. M.		*Tons.*	*Miles.*	*Seconds.*	*Feet.*	*Feet.*	
10 7	12	72	30	60	2,600	1,400	Some time (about 30 seconds) after the end of this tremor, the noise of the train was heard more loudly, and a small tremor was immediately perceived again.
10 14	- Ballast train -			89	- -	- - -	Tremor sensibly diminished in the tunnel.
10 23	11	75	34	70	3,500	1,800	Wires visible in the tunnel.
10 44	7	50	30	65	2,900	1,500	Tremor diminished in the tunnel.
11 0	5	40	30	103	4,500	2,200	Tremor considerably diminished in the tunnel.
11 16	13	73	28	80	3,300	1,700	Wires visible in the tunnel.
11 24	4	35	30	77	3,400	1,700	Wires visible well in the tunnel.

There

Correspondence &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

There are two circumstances connected with the observations of March 9, which deserve special attention.

The first is, that in the observation of 10h. 7m., when the sound of the train, though continuous, had partly died away, and suddenly increased (in the fluctuations of the state of the air), the tremor was immediately restored. This appears to corroborate an idea, expressed by Mr. R. Stephenson in the discussion of last year, as resulting from experiments made by himself, that the agitation is conveyed in a great measure by the air. Whatever the reason may be, it is certain that the tremor is very materially diminished when the train is in the tunnel. The presence of the sun's image, and the observation of the extent to which it was disturbed, gave me a good measure of the proportion of disturbances; and I think that, roughly speaking, the disturbance when the train was in the middle of the tunnel was about one-half of what it was when the train was about to enter, or had just left the tunnel, although the distance of the train was considerably less at the former time than at the latter.

The second circumstance is, that the presence of the sun's image enabled me to make observations which gave an idea of the smallness of the tremor which is the subject of these observations. My eye having become familiar with the extent of his greatest disturbance, I tried repeatedly from what height it was necessary to drop the cap of the telescope (the only weight within reach at the time) upon the turf, in order to produce the same disturbance. After many trials, I found that the disturbance was sensibly the same when the height was five inches. The distance from the mercury-trough was about five feet. The weight of the cap, as I have since ascertained, exceeds by a few grains four ounces avoirdupois. The turf on which it was dropped was exceedingly soft (the meadow being very wet). The tremor for this fall disappeared in about two seconds of time.

In regard to the absolute result deducible from these observations, as applying to the circumstances of Greenwich Park, it is to be remarked that the great difference in the character of the soils makes it impossible to apply at once to one locality the results found to be applicable to the other. In the year 1836, I made experiments on the tremor produced by trains on the Greenwich Railway (consisting of arches upon a soil of shingle and sharp sand, differing from that of Greenwich Park in no circumstance except that of being filled with water), of which a report was made to the Admiralty under date of 1836, February 4; of which the general result was, that the tremor was sensible at the distance of 1,100 feet. The result of the observations now detailed is, that the tremor is sensible, in the compact clay of Kensal-green, to the distance of 1,700 feet.

The positive result shown by these experiments is, that the tremor is very much diminished where the railway enters a tunnel.

Some importance having been attached by many persons to the effect of a trench in stopping vibrations of the ground, I think it proper to mention that, on the eastern side of my station, there was a deep ditch at the distance of about 100 yards, and no such ditch on the other side; and that I did not perceive that the tremor was diminished by this ditch. The tremor, which came with a sudden increase of noise, travelled across this ditch.

Royal Observatory, Greenwich,
19 March 1846.

(signed) *G. B. Airy.*

No. 35.

No. 35.

From Mr. *E. W. James* to the Lords Commissioners of the Admiralty.

Crooms-hill, Greenwich,
20 March 1846.

My Lords and Gentlemen,

I AM directed by the vicar, churchwardens and other inhabitants of this parish, being a committee appointed at a public vestry of the inhabitants, held on the 27th ultimo, to transmit to you the accompanying memorial, and respectfully to request your attention thereto.

I am, &c.
(signed) *E. W. James*, Vestry Clerk, &c.

The Right hon. and Hon.
The Lords Commissioners of the Admiralty.

Enclosure in No. 35.

Encl. in No. 35.

To the Right honourable and Honourable the Lords Commissioners of the Admiralty.

The MEMORIAL of the Vicar, Churchwardens, and other Inhabitants of the Town and Parish of Greenwich, in the County of Kent, being a Committee appointed by the Parishioners, assembled at a public Vestry Meeting, on Friday, the 27th day of February 1846,

Respectfully Showeth,

THAT your memorialists perceive that a Bill is now before the House of Commons, intituled, "A Bill to enable the South Eastern Railway Company to make a Railway from the London and Greenwich Railway, to join the South Eastern, Canterbury, Ramsgate and

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

Margate Railway, in the Parish of Chilham, in the County of Kent," being No. 2, of the South Eastern Company's series of Bills now before the House.

That the said Company propose, by such Bill, to obtain power to carry their line from the present terminus of the London and Greenwich Railway, at Greenwich, across five of the principal highways of that town, namely, Prince of Orange-lane, London-street, Royal-hill, Crooms-hill, and Maize-hill, and through the Royal Park, between Flamstead House and Greenwich Hospital.

That in so doing the said Company propose to raise the carriage-way of London-street five feet over an arch, and to pass under through a cutting 11 feet deep, and to proceed from thence by raising the ground of the highway called Royal-hill, by a tunnel under the highways of Crooms-hill and Maize-hill, which said cuttings and tunnels will be productive of serious inconvenience to the owners and occupiers of houses adjoining such highways, and of passengers generally, and occasion great difficulties in the sewage and drainage of those parts of the town.

That the proposed line of railway through the Royal Park is open to the most serious objections, whether such line be carried through by means of a tunnel, cutting, embankment, or viaduct, which objections, as they must be obvious to your Lordships, and have been already urged on your attention in former memorials, it is not necessary here to repeat.

That as the South Eastern Railway Company propose, by their said Bill, to avail themselves of an alternative line, if the sanction of Her Majesty's Government should be refused to the crossing Greenwich Park, the said Company would thereby still be enabled to continue their line of railway from London to Chilham, without defacing or injuring the town of Greenwich, or destroying the neighbourhood and retirement of the Royal Park.

That your memorialists beg respectfully to advert to a letter received by the authorities of this parish from your Lordships, dated the 6th of June last, in answer to their memorial dated the 20th May 1845, in which memorial the objections to this measure were fully stated, and in that letter your Lordships informed the memorialists of your disapproval of the then proposed line of extension, and the refusal of your consent to the Bill for that purpose.

That the line of extension now proposed by the said Company to be made through the town of Greenwich is precisely the same as that proposed by their Bill introduced in the last Session of Parliament, and to which Bill your Lordships stated your determination to refuse your consent.

That your memorialists, therefore, most respectfully pray, that your Lordships will, on this as on former occasions, refuse your consent to the South Eastern Company's proposed line of railway through Greenwich Park.

And your memorialists will ever pray, &c.

Greenwich, March 1846.

(signed) W. A Soames, Vicar.
Wm. Neale, Churchwardens.
Wm. Clark, Churchwardens.
F. T. Hudson.
B. Carter.
George Reeve.
Henry Kull.
George Carpenter.
James Laing.
John Morley.

(signed) E. W. James, Vestry Clerk, &c.
Crooms-hill, Greenwich.

No. 36.

No. 36.

From *T. Crofton Croker*, Esq., to the Right hon. *H. T. L. Corry*, M. P.

4, Hyde-park-gate, South, Kensington Gore,
25 March 1846.

Sir,

I AM desired by the Council of the British Archæological Association to acquaint you, that among the communications laid before them this day was one respecting an intention of cutting a tunnel for a railroad so near the Royal Observatory, that the tremulous motion produced by the railway carriages might seriously affect the accuracy of astronomical observations.

Although the promotion of astronomical science does not come within the objects of the British Archæological Association, the Council, nevertheless, think it right to submit the statement made to them for the consideration of the Lords Commissioners of the Admiralty, and desire me to request that you will do so.

I have, &c.
(signed) *T. Crofton Croker.*

The Right hon. H. T. L. Corry, M. P.,
&c. &c. &c.

No. 37.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

No. 37.

No. 37.

To the Lords of the Admiralty.

The MEMORIAL of the undersigned Inhabitants of the Town and Parish of Woolwich, in the County of Kent.

Showeth,

THAT your memorialists are anxious to renew to your Right honourable Board the deep interest which they feel in the success of a direct line of railway in continuation of the London and Greenwich Railway to Woolwich.

Your memorialists beg to state that a large proportion of the population of Woolwich are engaged in business in connexion with London, and that it is of the utmost importance to them that the most direct and perfect communication should be open to them.

That your memorialists have heard with the greatest satisfaction that your Right honourable Board have been pleased to signify your assent to the passing of the South Eastern Railway in a tunnel through Greenwich Park.

That the said work will be of the highest importance to your memorialists and the inhabitants of the neighbouring district.

Your memorialists therefore humbly pray that your Right honourable Board will be pleased to give your support to the said work, which will be one of great public utility, and will confer great benefit on your memorialists.

And your memorialists will ever pray, &c.

M. Greenhow, rector.
W. Nokes, solicitor.
J. Ledbetter.
W. H. Sandford.
Thomas Sloman.
John Taylor, jun.
Charles Simmons.
William Taylor.
Francis Croucher.
William Beeching.
William Fuller.
William Hartfield.
J. Gordon, jun.
Daniel M'Carty.
T. J. Hughes.
John Beaven.
Thomas Thomas.
John Shott.
J. Smith.
J. Hammond.
W. G. Miller.
William Chapman.
John Hammond.
Thomas Rice.
Edward Smith.
James Winn.
W. Randell.
John Robertson.
John Felix Smith.
Thomas Tune, jun.
William Wales.
Nicholas Mould.
George Roberts.
John Wren.
J. R. Rule.
John Booth.
James Williams.
James Sims.
Thomas Duffill.
Thomas Williams.
Oswell Orme.
James Martin.
James Jackson.
Thomas Reynolds.
John Mulliner.
William Matthews.
Jos. Parkin.
Richard Mannering.
James Wilson.
Samuel Pearson.
Charles Holmes.
Thomas Griffiths.
John Hadden.
William Hadden.
Joseph Thomas Williams.
James Sharp.
John Shott.
G. Goldsack.
Anthony Tyler.
Joseph Rose.
John Course, sen.
John Course, jun.
John Mould.
Richard Power.
John Power.
John Hastings.
Joseph Craig.
William Danson.
William Taylor.
Richard Sears.
William Tomson.
W. Paisey.
C. Wilson.
Charles Warrington.
John Myers.
F. Baker.
J. Haslett.
J. Denovan.
Stephen Roughten.
John Hindle.
George Hill, 4, Sand-hill.
John Vaughan, 49, William-street.
George Martin, Hardin's-lane.
John Cowen, Greenwich guardian.
Joseph Harwood, Richard-street.
Lewis Davis, William-street.
James George Russell, Richard-street.
James Dampier, Richard-street.
Steward R. Ban, Hare-street.
George Willes, High-street.
John Reilly, High-street.
George Ranwell, High-street.
J. H. Watts, High-street.
Goodwin Pepper, High-street.
E. Smith, Richard-street.
James Black, Powis-street.
Joseph Meson, Green's-end.
Thomas Hawes Jones.
William Harradine, Powis-street.
George Dennen.
Thomas Palfreman.
Edward Smith.
Thomas Harden.
John Ellis.
F. Harte.
Aug. Prater, 8, William-street.
Henry Sow, Powis-street.
William Henry Whiteman, Powis-street.
Thomas Hurditch.
William Covil.
James Parsons.
Thomas Dennis.
John Roberts.
B. Knight.
Thomas Simmons.
William Fitch.
William Hill.
James Groves.
T. Proctor.
E. Payne.
David Hall.
Charles Tilden.
Thomas Wild.
E. Carter.
Thomas Jones.
Charles Bishop.
E. Randell.
Thomas Davis.
John Leister.
J. Studd.
H S. Miskin.
James Moulton.
W. H. Davis.

W. H. Davis.
James Wallace.
G. J. Lockwood.
J. S. Miskin.
Thomas Graveley.
William Barnes.
George King.
Josh. Smart.
James Caxton.
Isaac Williams.
William Fielding.
John Lewis.
John Stevens.
Denis Lynch.
John Lines.
Charles Cousens.
Robert Littler.
Edward Cannon.
William Johnson.
George Butler.
William Punter.
William Evrest.
J. A. Rastrick.
G. Baker, sen.
Jonas Thompson.
G. Baker, jun.
G. W. Varlo.
T. H. Royd.
F. Dutton.
J. Kingston.
J. Cooper.
W. H. Woodward.
George Allsop.
C. Bentley.
P. Cowley.
J. Stride.
Robert Murray.
George Faulkner.
Joseph Henley.
William Grove.
William Cross.
J. Millar.
Henry Edward Jaggars.
William Fortescue.
James M'Clare.
Charles Hilor.
John M'Clare.
Joseph Cunningham.
William Whats.
John Pearson.
Joseph M'Bride.
Peter Flanagan.
Francis Galavan.
Charles Melton.
Jarvis Read.
Henry Lawson.
John Taylor.
William Creed, Hare-street.
John Jackson.
John Harris, Richard-street.
John Green, Richard-street.
Charles Molloy, Beresford-street.
Michael Joseph Holland, Richard-street.
William Hammond, Powis-street.
Leonard Hammond, Powis-street.
James Gosling, Powis-street.
James Wates, jun., Powis-street.
William Flide, Powis-street.
James Hendun, Powis-street.
Francis Thomas Askins, Powis-street.
James Lamb, Green's-end.
John Bayly, 1, Thomas-street.
Richard Bayly, New-road.
David Davis, Green's-end.
John Smith, William-street.
Charles Henry King, 60, William-street.
Thomas Palmer, 59, William-street.
Hugh M'Clean
Thomas Botterill.
Joseph Cohen.
James Walters.
W. T. Spiers.
J. W. Newhall.
C. Horan.
David Davies.
Charles Stuart.
James Hubbard, Powis-street.
G. H. Graham.
J. Malcolm.
T. Osbern.
J. Taylor.
Robert Mellish.
William Archer.
Thomas Barker.
John King.
Henry Groves.
John Gordon.
John Wright.
James Dadswell.
N. Osborne.
W. Bowley.
George Webb.
J. Bishop.
William Stuart.
S. J. P. Parker.
Henry Studd.
B. Hide.
W. Inch.
T. R. L. Lockwood.
W. Peck.
J. Rowland.
R. W. Dutton.
William Randall.
W. H. Alford.
Thomas Edwards.
Richard Seddon.
A. D. Ramsey.
James Hill.
George Knight.
John Christie.
Abram Bain.
John Rance.
Richard Nok.
William Martin.
J. D. Webster.
J. Chandler.
Edmund Marshall.
W. M. Urquhart.
John Hill.
A. Sutherland.
D. Williams.
R. Prowse.
J. Edwards.
B. Winn.
William Sutherland.
Charles Williams.
G. Scholes.
W. P. Wilson.
Joseph Unthank.
Thomas Fincke.
Thomas Crowther.
John Craven.
J. Moore.
John Williams.
Thomas Archibald.
William Sibbles.
William Gibson.
Charles Moore.
Joseph May.
James Cranston.
John Wall.
Thomas Armstrong.
G. Browning.
C. Rowland.
J. Rabee.
John Fortman.
Robert Davis.
Charles Davis.
G. Adams.
A. Barber.
A. Blest.
James Blest.
George A. Copeland.
J. Cope.
William Walker.
J. Jackson.
John M'Gill.
Joseph Haslett, High-street.

No. 38.

No. 38.

From *J. P. Fearon*, Esq., to the Lords of the Admiralty.

South Eastern Railway Office,
35 A., Great George-street, 28 April 1846.

My Lords,

As solicitor to the South Eastern Railway Company, I beg respectfully to call your attention to the adverse feeling which has hitherto been expressed by your Lordships to that portion of their North Kent line which was proposed to pass through Greenwich Park. I have been informed that a report of the Astronomer Royal has led your Lordships to consider that the apprehension of injury to the Royal Observatory is not entitled to the importance which was originally

originally attached to it, and that the opposition of your Lordships would be withdrawn.

If such is the case, may I venture respectfully to state that an early intimation would be of great importance, as the Bill is now before the House of Commons.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

I have, &c.

To the Lords of the Admiralty. (signed) *J. P. Fearon*

No. 39.

No. 39.

35 A., Great George-street,
30 April 1846.

My dear Sir,

I HAVE the pleasure of enclosing you a copy of the experiments made by Mr. Hind for Mr. R Stephenson, with a view of ascertaining what distance the vibration may be sensible.

Yours very faithfully,

Captain W. A. B. Hamilton, R. N., &c. &c. &c. (signed) *Torrington.*

Enclosure in No. 39.

Encl. in No. 39.

REPORT on the Vibration produced by Trains in passing through the Tunnel at *Kensal Green.*

Mr. Bishop's Observatory, Regent's-Park,
17 April 1846.

Sir,

I HAVE the honour to submit to you the results of the series of experiments performed at Kensal Green, with the view of ascertaining to what distance the vibration produced by a train in passing through the tunnel may be sensible.

In these experiments I employed a basin of quicksilver, which was placed on the ground and fixed as firmly as possible. A lens, carrying a set of cross wires was attached in such manner that the image of the wires could be reflected in the mercury, and therefore any vibration of the mercury could be easily detected by the oscillation of the reflected image. A piece of glass effectually protected the mercury from currents of wind, and the experiments were thereby rendered very satisfactory. In observing the reflected wires I did not employ a telescope, as a previous trial had convinced me that no material advantage would arise from the use of a telescope, since the sensibility of the eye, in detecting the vibration of the mercury, was far greater than I could have expected, and more than sufficiently delicate for the purpose in view.

The situation selected was a field belonging to Mr. Sullon, on the north side of the tunnel. The distances were measured with a land-chain from the northern side as nearly as its position could be ascertained.

April 16, the day cloudy, but without rain; a moderate breeze blowing from the eastward.

Distance 60 feet.—Down train, very great vibration. The reflecting image of the wires was quite invisible from agitation as the train approached the centre of the tunnel, the vibration commenced immediately the train entered the tunnel, and ceased the moment that it left.

Distance 138 feet.—Down train; the vibration began about two seconds after the train entered, and ceased about the same time before it was out of the tunnel; though the amount of oscillation was much less than at 60 feet, it was still considerable.

Distance 300 feet.—Down train; the vibration began immediately the train was in the tunnel, and continued about 10 seconds after it had left; the train was in the tunnel 20 seconds.

Distance 472 feet.—A heavy down train, 32 seconds in passing through the tunnel. The vibration was seen about 7 seconds after it was in the tunnel, and ceased 4 seconds before it left. The amount was rather considerable.

Distance 572 feet.—Up train, 20 seconds in tunnel. The oscillation of the mercury was sensible 5 seconds after the train entered, and ceased 10 seconds before it emerged from the tunnel. Another up-train produced the same effect.

Distance 644 feet.—A down train, 20 seconds in the tunnel, produced not the slightest effect. The observation very satisfactory.

Distance 609 feet.—A down train 27 seconds in the tunnel. The vibration so excessively small as to be visible only by transient glimpses when the train was fairly in the tunnel. I consider this to be the distance where the vibration becomes sensible, and that beyond it the trains will have no perceptible effect in this locality.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

The following are the estimated values for the amount of vibration though necessarily very rude approximations, may still be interesting :—

Distance	60 feet,	amount of vibration	-	100
„	138 feet	„	-	40
„	300 feet	„	-	25
„	472 feet	„	-	10
„	572 feet	„	-	5
„	609 feet	„	-	1
„	644 feet	„	-	0

On April 11 some observations were attempted in a field adjoining that belonging to Mr. Sullon, at a distance from the tunnel of about 400 feet, but the perpendicular drawn from the place of observation to the tunnel would fall not more than 50 feet from the entrance; and this circumstance, in addition to most unfavourable weather, probably prevented my seeing any vibration. An objection being raised on this day against the performance of the experiments on Mr. Sullon's property, I was unable to proceed until the 15th, when that gentleman was kind enough to allow me the use of the field on the north side of the tunnel, a most favourable locality for the purpose.

On April 15th, I made some experiments to ascertain whether a horizontal wire of a transit telescope placed at different distances from the tunnel, and made to bisect a distant object, would show the vibration at those distances to be sensible. I very soon found that this method was not sufficiently delicate, as no vibration could be detected even at 60 feet distance from the side of the tunnel; the experiments with mercury on the following day were made under very favourable circumstances, and the results are, I believe, worthy of great confidence.

I have, &c.

To R. Stephenson, Esq. (signed) *J. R. Hind.*

No. 40.

No. 40.

From *John P. Fearon*, Esq., to the Lords of the Admiralty.

South Eastern Railway Office, 35A, Great George-street,
2 May 1846.

My Lords,

As solicitor to the South Eastern Railway Company, I have the honour to submit to your Lordships, in reference to the apprehension entertained of danger to the instruments in the Royal Observatory at Greenwich, from the passing of the proposed extension of the Greenwich Railway through the Park, that the engineers of the Company, and other scientific persons have, after minute experiments, pronounced a strong opinion that the apprehended difficulty will not arise.

I therefore, on the part of the Company, beg to submit to your Lordships, that in the event of your permitting this railway to pass under Greenwich Park, the Company will insert such a clause in the Bill, as may secure to the Admiralty the power of stopping the working of the line, or enforcing the adoption of such measures as they may think necessary for the protection of the Observatory, in the event of the Astronomer Royal reporting to my Lords that vibration has arisen, so as to interfere with the due conduct of the observations.

I have, &c.

(signed) *John P. Fearon.*

To the Lords of the Admiralty.

Encl. in No. 40.

Enclosure in No. 40.

South Eastern Railway, 6, Spring Garden,
30 April 1846.

Gentlemen,

As desired by you, I inspected yesterday and to-day Greenwich Park, for the purpose of considering more particularly that portion of it under which a railway tunnel is designed to be executed, according to a plan and section with which I was furnished by your engineer, Mr. Robert Stephenson; my instructions being to ascertain and state my opinion, whether by the construction of a tunnel, injury to the scenery of the Park would be occasioned, and I beg leave to report, in the first place, that as the line of the proposed tunnel would pass at a right angle under three avenues of trees, at only three to five feet under the surface of the ground, the trees at those three places would necessarily be to be removed to the extent of perhaps five

trees

trees in each avenue. The avenues are at present not perfect, the trees being of various ages, some in a state of decay, and they are not planted at regular distances.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

I find that, as the top of the tunnel, towards the west end of the Park, is marked on the section, nearly level with the surface of the ground, there would be a necessity to deposit earth in that district to cover the tunnel.

The raising of the surface of the Park here would be an improvement, as it is at this time under the public road, Crooms-hill, provided that the earth filling be not extended so far as the trees.

I should, however, state, that since my inspection, I have been informed by your engineer that the tunnel may be constructed at a depth under the surface, so as to render it unnecessary to raise the present surface of the ground.

It struck me forcibly in proceeding through Greenwich, that the present tortuous course through narrow streets, is mean and unworthy to be the principal and London approach to the Royal Park; I inspected, therefore, the district between the park and the railway station in London-street, Greenwich, with the object of finding a line for a more direct and spacious road, which obviously presents itself adjoining and parallel to that laid down for your proposed railway. I think, for the above reason, that the Commissioners of Her Majesty's Woods, &c., should, in the event of the railway being permitted to pass under the park, require that a public road not less than 40 feet wide should be formed in the line above proposed, as explained in the accompanying sketch plan, and that handsome architectural park entrance gates should be erected opposite to the east end of this new road, according to a design to be approved by the Commissioners. From this, which would be the principal and most frequented gate of the Park, a drive or wide gravel walk should extend thence eastward, through and across the three avenues of trees which run north and south, and as the line for this drive would be that of the tunnel, the removal of the trees consequent upon the execution of the tunnel would not therefore be to be regretted. Indeed I cannot but think that the sub-division, as at present, of the north portion of the park into three compartments, like fields or paddocks, by the existing lines of trees, is far from being satisfactory, and that the three openings, as well as others through these belts, might be made with real and important advantage to the scenery.

Desirous of having my views confirmed or controverted on these points of landscape gardening, I invited, with your permission, Mr. Nesfield to visit the locality and study the subject. He has accordingly been on the spot this day, and, I believe, coincides generally with the above opinions, and has stated his views in a separate report to yourselves.

As the backs of the buildings north-west of the park offer most unsightly appearance, I think that in lieu of the present low paling and hedge, a high and handsome wall should be built, extending from Croom's-hill to the north gate, by the new church, which should be masked by a mound of earth, planted with shrubs and evergreeens, enclosed with an iron railing.

On the whole, I have no hesitation in stating my opinion, that so far from the scenery of the park being injured by the proposed tunnel, it might be considerably improved in effect, whilst in addition the opportunity would be afforded of obtaining for the public most important advantages, through the means of the approach and vista I have referred to.

I presume always that a mere right of way under the surface of the park is applied for by the Railway Company, and that the ground would be broken up and the tunnel constructed, in short lengths, the surface being reformed and thrown open to the public previous to a fresh opening being made, each of such portions of the work being temporarily, and from time to time fenced in, so as thus to interfere as little as possible with the recreation and safety of the numerous visitants of the Park.

I am, &c.,
(signed) *D. Burton.*

To the Directors of the South Eastern Railway Company.

No. 41.

No. 41.

From Captain *W. A. B. Hamilton*, R. N., to *J. P. Fearon*, Esq.

Sir, Admiralty, 2 May 1846.

In reply to your letter of this day's date, submitting a clause for insertion in the Bill, in the event of permission being given to the South Eastern Railway Company to pass under Greenwich Park, I am to acquaint you, for the information of the said Company, that my Lords, as at present advised, are not prepared to assent to this proposal.

I am, &c.,
(signed) *W. A. B. Hamilton.*

J. P. Fearon, Esq.,
35, Great George-street.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

No. 42.

No. 42.

From *Alexander Milne*, Esq., to Captain *W. A. B. Hamilton*, R.N.

Mr. MILNE presents his compliments to Captain Hamilton, and with reference to the enclosed extract of a letter to the Commissioners of Woods from the promoters of the South Eastern Railway, requests the favour of information if the Lords of the Admiralty adhere to or have relinquished their objections to the proposed passage of that railway, by tunnel, under Greenwich Park.

Office of Woods, 2 May 1846.

Encl. in No. 42.

Enclosure in No. 42.

EXTRACT from a Letter addressed to the COMMISSIONERS OF WOODS, &c., by *J. P. Fearon*, Esq., dated 1 May 1846.

REFERRING to the communication which I have had the honour to make on the part of the South Eastern Railway Company, with reference to a proposed line of railway under Greenwich Park, I am instructed by the Directors of that Company to submit to the consideration of your Honourable Board the following additional statement.

The measure has, as you are aware, been up to this time opposed by the Lords of the Admiralty, on the ground of apprehended injury to the Royal Observatory.

The Directors of this Company have, however, been informed that there is reason for believing that their Lordships have, on further examination, been led to doubt whether any sufficient grounds for such apprehension exist.

No. 43.

No. 43.

From Captain *W. A. B. Hamilton*, R. N., to *Alexander Milne*, Esq.

Sir, Admiralty, 2 May 1846.

WITH reference to your note of this day's date, enclosing an extract of a letter dated 1st instant, from Mr. Fearon, addressed to the Commissioners of Woods and Forests, I am commanded by my Lords Commissioners of the Admiralty to acquaint you that, as at present advised, they see no reason to withdraw their objections to the proposed line of the South Eastern Railway under Greenwich Park, and that Mr. Fearon is therefore in error in stating, as he does in his letter of yesterday's date, that my Lords are disposed to doubt there being sufficient grounds for continuing these objections.

I am, &c.,

Alexander Milne, Esq., (signed) *W. A. B. Hamilton.*
Office of Woods and Forests.

No. 44.

No. 44.

From Professor *Airy* to the Earl of *Ellenborough*.

My Lord, Royal Observatory, Greenwich, 6 May 1846.

THIS morning I wrote hastily to your Lordship respecting some explanations and proposals on the part of the South Eastern Railway Company, which, as I understood from Mr. Rich, it was matter of importance that you should receive in outline without delay. I have the honour now to submit to your Lordship, at somewhat greater length, my ideas upon these matters.

The explanation which Mr. Rich was anxious to urge was, that the heavier and more rapid trains to Kent generally, and the large passenger trains to Gravesend, would not pass by the Greenwich and Woolwich line (taking the direct way to Eltham), although some carriages would pass upon the Greenwich and Woolwich line to join the direct line at Plumstead. The trains passing through the park tunnel would, therefore, carry no more than the following,—the whole Woolwich traffic from London and Greenwich, and the Kent traffic from Greenwich. These trains would certainly be light; in all probability much lighter than those on the Birmingham Railway, which were the subject of my experiments, of which an account has been transmitted to your Lordship. I presume that the engines would be proportionally lighter, and it seems likely that

that the disturbance would, from this cause, be felt to a smaller distance than that specified by me as the result of my experiments.

The proposal made by Mr. Rich, on the part of the South Eastern Company, was, that a clause should be inserted in the Act of Parliament for constructing the railway, to the effect that the Admiralty, or other body guarding the interests of the Royal Observatory, might have the power even of stopping the traffic upon the railway, if it should be proved that the railway was injurious to the Observatory. I cannot state this proposal, to your Lordship without appending to it my conviction that such a power never could be exercised. But it might be practicable to insert a clause empowering the Admiralty, &c., to fix the maximum speed through the tunnel, and maximum weight of the trains, under penalties, cumulative for every transgression, and recoverable in some summary way; and upon the more important element of offence, the speed, the Astronomer Royal could at any time procure most accurate evidence.

I am fully persuaded that this enactment would give all reasonable security to the Observatory. The first measure after that the tunnel was constructed would be to run experimental trains, of different weights, with different speeds, and different pressures of steam, and to arrange the weights, speeds, &c., which should be permanently adopted.

I cannot omit to express to your Lordship my personal conviction that it would be, not only just, but also politic, for the interests of the Observatory, that no unfair importance should now be given to them in treating the question of a railway through the Park, or rather through some part of the low ground between Greenwich-hill and the Thames. Knowing, from my intercourse in the neighbourhood, the want of railway communication with Woolwich, and knowing the form of the ground, I have the strongest possible belief that a railway will be made through the Park within 10 years. It is in the power of the Admiralty to take all reasonable securities against injury to the Observatory and the Park at present; but it will not be in their power to do so when a railway shall be forced through by the demands of the district requiring it.

I have, &c.

(signed) *G. B. Airy.*

The Right hon. the Earl of Ellenborough,
&c. &c. &c.
First Lord of the Admiralty.

No. 45.

No. 45.

From *John P. Fearon*, Esq., to the Lords of the Admiralty.

South Eastern Railway Office,
35A, Great George-street, Westminster,
6 May 1846.

My Lords,

Referring to the communications which I have had the honour to make to the Board of Admiralty, with reference to the proposed tunnel under Greenwich Park, I am instructed by the Directors of the South Eastern Railway Company to state, that, in the event of the consent of the Lords of the Admiralty being given to such work, they will be ready to insert in the Bill clauses to the following effect; viz.—

That the Admiralty shall have power to regulate the speed of the trains through the tunnel, and to stop the trains altogether, should there be any practical injury done to the observations at the Royal Observatory.

I have, &c.

(signed) *John P. Fearon.*

The Right hon. the Lords of the Admiralty.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

No. 46.

No. 46.

From Captain *W. A. B. Hamilton*, R.N., to Viscount *Torrington*.

My Lord, Admiralty, 9 May 1846.

I AM commanded by my Lords Commissioners of the Admiralty to acquaint your Lordships, that my Lords will withdraw their opposition to the South Eastern Kent Railway Bill, on the understanding that the railway is to be carried through a tunnel under Greenwich Park, and that such clauses as the Admiralty may think proper to require be inserted in the Bill, giving power to the Admiralty to regulate the speed and weight of the trains passing through such tunnel, and to impose such penalties as they may think fit for the infraction of the regulations they may lay down for that purpose, and to make any further regulations they may deem necessary for the purpose of preventing any practical injury to observations made at the Royal Observatory, of which injury they shall be the sole judges; with such further penalties, on the infraction of such regulations as they may deem expedient; and also, in the event of the contravention of such regulations, to stop the passage of trains altogether, should they consider it necessary so to do.

I am, &c.

(signed) *W. A. B. Hamilton.*

Viscount Torrington,
South Eastern Railway Office, Park-street.

No. 47.

No. 47.

From *G. J. Johnson*, Esq., to Right hon. *H. T. L. Corry*.

Sir, Greenhithe, 27 May 1846.

I HAVE the honour to enclose, for the information of my Lords Commissioners of the Admiralty, a paper containing the results of experiments which have been made, with the view of ascertaining at what distance the passage of railway trains would affect delicate magnetic instruments.

These results indicate that, at the respective distances of 151, 193 and 240 feet (nearly upon the same level as the trains) the magnetic collimator was disturbed; and, in some instances, the needle suspended between the two magnets was observed to be affected.

In one case the latter showed a slight disturbance at the distance of 389 feet.

The experiments before alluded to having been made under shelter of the buildings about the railway stations, I deemed it advisable to wait for a calm day, and try the effect at a greater distance in an open field; and the results obtained will will be found in the last part of the Table. These indicate, that at the distance of 473 feet no perceptible disturbance of the needles took place, and that the magnetic collimator was once, during the passage of 10 trains, observed to be slightly affected in a vertical direction, which, however, did not alter the reading of the horizontal scale.

During these experiments a mercurial artificial horizon was observed to be generally more or less affected.

In conclusion, I have only to observe, that there can be no doubt but the distance at which delicate instruments may be affected by the passage of railway trains, will greatly depend upon the nature of the strata on which they and the rails may be placed, and likewise upon the weight and velocity of the trains.

I have, &c.

(signed) *G. J. Johnson*, Captain R.N.

Right hon. H. T. L. Corry, M.P., &c. &c. &c.
Admiralty.

RESULTS of EXPERIMENTS, made with the view of ascertaining at what Distance delicate Magnetic Instruments would be disturbed by the Passage of Railway Trains, the effect upon a Mercurial Artificial Horizon being observed at the same time.

Position of Instruments.	Mercurial Artificial Horizon observed with a Sextant.	Magnetic Collimator observed with the Telescope of a Theodilite.	Two very Small Steel Needles suspended between the Poles of Two Magnets, observed without optical aid.
Euston-Square Station.			
Distance of instruments from the departure line, 151 feet. Distance of instruments from the arrival line, 193 feet.	mercury much disturbed when the train passed.	slight vibratory motion - -	one needle slightly disturbed.
Camden Town Station.			
First position of instruments, 240 feet from the line.	slight disturbance of the mercury on the "arrival" train passing.	horizontal vibration of the collimator, two divisions of the scale; vertical motion, half the depth of scale.	no disturbance of the two needles visible with the naked eye.
	vibrations very apparent on the fast train passing.	a small horizontal vibration, and likewise a vertical motion observable.	no disturbance of the two needles visible with the naked eye.
	on the slow trains passing, the vibrations were not so apparent as those produced by the fast trains.	no horizontal vibration observable, but a small vertical motion.	no disturbance observed with the naked eye.
Camden Town Station.			
Second position of instruments, 389 feet from the line.	vibration quite apparent when the train passed.	no perceptible disturbance - -	a very small motion observable by means of a magnifier, applied in this instance.
At a position 473 feet from the Croydon Railway.	slight disturbance (heavy train) -	no perceptible disturbance - -	no perceptible disturbance.
	no disturbance (short train) - -	no perceptible disturbance - -	no perceptible disturbance.
	very slight disturbance (short train)	no perceptible disturbance - -	no perceptible disturbance.
	no perceptible disturbance (long train).	no perceptible disturbance - -	no perceptible disturbance.
	no perceptible disturbance (engine and tender).	no perceptible disturbance - -	no perceptible disturbance.
	slight perceptible disturbance (fast train).	slightly perceptible vertical disturbance, but did not alter the horizontal reading of the scale.	none.
	slightly disturbed (fast train) -	no perceptible vibration - -	no perceptible disturbance.
	slight perceptible disturbance (fast train).	no perceptible vibration - -	no perceptible disturbance.
	slight perceptible disturbance (heavy train).	no perceptible vibration - -	no perceptible disturbance.
	Note.—A common compass needle was observed during the last experiments, but no perceptible disturbance took place.		

Observers { Captain Edward J. Johnson, R.N. / Mr. J. Brunton. / T. Belsbury.

G. J. Johnson, Captain, R.N.
Superintendent of Compass Department.

No. 48. No. 48.

To Her Majesty's Commissioners for executing the Office of Lord High Admiral of the United Kingdom.

The MEMORIAL of Sir Isaac Lyon Goldsmid, Baronet, Chairman; the Most Noble the Marquis of Conyngham, the Honourable William Ashley, Sir Brook William Bridges, Baronet, the Honourable Charles John Murray, Captain George William St. John Mildway, Michael M'Chlery, Charles M'Garel, Frederick Mildred, William Peters, John Diston Powles, Henry Thoby Prinsep, Joshua Walker, and George Whitmore, Esquires, the other members of the Committee of Management of the North Kent Railway Company,

Showeth,

THAT the said Company was formed for the construction of a direct and independent line of railway from London to Dover and Deal, in the shortest possible direction, passing entirely through the north of Kent, and embracing in its route the most important naval and military establishments of the empire, connecting them with the metropolis and with each other.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

That the South Eastern Company, having already a line of railway to Dover through a totally different part of the county, and 15 miles longer than the one projected by your memorialists, could only oppose your memorialists' Bill by proposing another line to Dover, generally similar to and in several of the most important points identical with the plans brought forward by your memorialists, seeking thereby to monopolize the entire of the important districts of Kent in opposition to the wishes of the population, expressed at public meetings in all the principal towns.

That some of the present promoters of the North Kent line of railway brought forward a scheme for a North Kent Railway, so long since as 1840, with a view to which Sir Isaac Lyon Goldsmid, then, as now, the chairman, and the present engineer of the proposed company, had communications with the officers of the Admiralty, with respect to the passage of the railway through or near to Greenwich Park, and upon that occasion it was expressly stipulated and required by the Admiralty authorities that the said railway should be kept at a distance of at least half a mile from the Royal Observatory in Greenwich Park.

That in a letter addressed to Sir Isaac Lyon Goldsmid, by the Secretary of the Board of Admiralty, on the 28th November 1840, there is the following paragraph:

> "My Lords have no objection to the railway passing, as proposed, to the southward of the Royal Observatory, provided it does not approach that building within half a mile, that being the distance to which it was originally promised to restrict it, and which restriction their Lordships most distinctly desire may be enforced."

That on the renewal of the said undertaking in 1841 and 1842, and also for the last and in the present Session of Parliament, the same condition of keeping half a mile from the Royal Observatory was required by the Admiralty, and submitted to by your memorialists.

That, in compliance with this condition, the engineer of the company laid down the present North Kent line so as to pass through Blackheath in a tunnel, at the distance of nearly 1,000 yards from the Royal Observatory.

That your memorialists have, under the circumstances aforesaid, considered that the question as to the passage of a railway through Greenwich Park had been conclusively settled in the negative, and particularly so after the letter of the Honourable Sydney Herbert to the President of the Board of Trade, on the 28th day of January 1845, as follows:

> "My dear Dalhousie, "Admiralty, 28 January 1845.
>
> "In reply to your note of the 24th instant, I beg to say that the Board had, on such satisfactory grounds, decided that no railway shall pass between the Royal Observatory, in Greenwich Park, and the river, and have so often repeated that decision to various applicants, that it cannot now be too peremptorily stated nor too generally known. I am sure that you may also consider such decision as conclusive.
>
> "Yours very sincerely,
>
> "*Sydney Herbert*.
>
> "The Earl of Dalhousie, &c. &c."

That on the 6th June 1845 a letter was addressed to the chairman of a meeting of the inhabitants of the town of Greenwich, as follows:

> "Sir, Admiralty, 6 June 1845.
>
> "Having laid before my Lords Commissioners of the Admiralty your memorial of the 21st May, on behalf of the inhabitants of the town of Greenwich, praying their Lordships' interference to prevent the extension of the Greenwich Railway to Crooms-hill, I am commanded by their Lordships to acquaint you, that they disapprove of the proposed extension, and will not give their consent to the Bill for that purpose.
>
> "I am, Sir,
>
> "Your most obedient servant,
>
> "*W. A. B. Hamilton*.
>
> "Rev. W. A. Soames, Greenwich."

That

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

That in the undertaking proposed by the North Kent Railway Company various important works and improvements in the River Medway had been arranged to have been executed at the expense of the Company, which improvements had been proposed and sanctioned by the director of engineering works of your Honourable Board; and your Honourable Board, both in the last and the present Session, has been understood to have entirely approved of the said undertaking.

That the Select Committee of the House of Commons, on the 16th of March last, began their sittings upon the several Bills for a North Kent Railway, brought in by your memorialists and by the South Eastern Railway Company, and at the commencement of the proceedings it was distinctly stated by the counsel for the South Eastern Company (they having two lines between Deptford and Woolwich), that the alternative line through Greenwich Park was abandoned on account of the objection of the Admiralty authorities, and that they should proceed for their north line, which passed round Blackheath; and a similar statement was made by the engineering witnesses of the South Eastern Company.

That it was only at the close of the proceedings of the Committee on the 7th May, and after they had been sitting on the Bills for nearly two months, that, to the great surprise of your memorialists, a consent on the part of the Board of Admiralty for the passing of the South Eastern line through the Park was tendered to the Committee by the South Eastern Company.

That the Committee afterwards determined to open their proceedings for the purpose of receiving such assent, and any evidence connected therewith.

That, finding that such assent of the Board of Admiralty had been given upon conditions which might either greatly impede the traffic over the railway, or stop its working altogether, your memorialists obtained an order from the House of Commons for the attendance of Professor Robinson, of Armagh, and proposed also to call several other scientific and practical astronomers for the purpose of proving, that the delicate astronomical observations made at the Royal Observatory would, in fact, be greatly affected by the transit of railway trains passing every seven minutes within 225 yards of the Observatory; but the Committee of the House of Commons declined to receive any such evidence.

That the said Committee have finally determined to report to the House of Commons in favour of the South Eastern Company's line, but no further than from Greenwich to Gravesend, adopting the line through Greenwich Park as the only one between London and Gravesend, by reason whereof the large traffic coming from that direction must be passed through the tunnel of Greenwich Park, and be subject to all the contingencies which may arise from the conditions of the Admiralty assent.

That your memorialists having, on their part, laid out their line in conformity to restrictions imposed by, and having obtained the express sanction thereto of your Honourable Board, feel themselves greatly aggrieved by reason of the assent which their opponents obtained for the passage of their line through Greenwich Park, at the very last moment of their proceedings before the Committee, and by which they obtained a most undue advantage over your memorialists.

Your memorialists, therefore, pray, that your Honourable Board will take all the circumstances into consideration; and they trust that it may be thought fit to withdraw an assent to the passage of a railway through Greenwich Park, which has only been given upon conditions that will probably render the tunnel useless for the purposes intended, though it has served to give to the South Eastern Company a very important and undue advantage over your memorialists.

(signed) *Isaac L. Goldsmid,*

On behalf of the Committee of Management.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

No. 49.

No. 49.

From Captain *W. A. B. Hamilton*, R.N., to Sir *Isaac Lyon Goldsmid*, Bart.

Sir, Admiralty, 27 May 1846.

I HAVE received your memorial on the part of the Committee of Management of the North Kent Railway Company, and I have laid the same before my Lords Commissioners of the Admiralty.

I am, &c.

(signed) *W. A. B. Hamilton.*

Sir Isaac Lyon Goldsmid, bart., Chairman,
North Kent Railway Company,
4, Trafalgar-square.

No. 50.

No. 50.

From Captain *W. A. B. Hamilton*, R.N., to the Professor of Astronomy.

Sir, Admiralty, 26 May 1846.

I AM commanded by my Lords Commissioners of the Admiralty to transmit to you copies of three letters from the Astronomer Royal on the subject of the proposed railway passing through Greenwich Park within a certain distance of the Royal Observatory, and my Lords desire me to request that you will be good enough, after perusing the statements of the Astronomer Royal, to state whether you concur in the opinion therein expressed, and whether you think that, under the restrictions suggested by the Astronomer Royal, any mischief would ensue to the observations.

I am, &c.

To the Professor of Astronomy,
The Observatory, Oxford.

(signed) *W. A. B. Hamilton.*

[Similar letters were addressed to the Professor of Astronomy at Cambridge, to Sir J. Herschel, Bart., to Dr. Robinson, Dublin, and to Charles Babbage, esq.]

No. 51.

No. 51.

Sir *J. F. W. Herschel*, Bart., to Captain *W. A. B. Hamilton*, R.N.

Sir, Collingwood, 1 June 1846.

I HAVE received the documents which you have forwarded me by direction of the Lords Commissioners of the Admiralty, with your letter, calling my attention to the points, whether I concur in the opinion of the Astronomer Royal, and think that, under such restrictions as he suggests relative to a limitation by Act of Parliament of the weight and speed of the trains, any mischief would accrue to the observations made at the Royal Observatory from the proposed railway tunnel under Greenwich Park.

The experiments of the Astronomer Royal, on ground probably more calculated to convey vibration than that of Greenwich Park, show that a perceptible vibration was communicated from the Kensal Green tunnel to a distance varying from 1,100 to 1,700 feet, being at a medium about double the distance of the proposed line from the Royal Observatory. The tremor appears to have been, however, very minute, not more than that produced by dropping a weight of four ounces from a height of five inches on the turf at five feet distance from the mercury experimented on.

Still a tremor, however minute, if perceptible at all, and if continued during the whole time of a star or planet passing through the most favourable part of the field of view of a telescope for its bisection under high magnifying powers, could not fail to be a source of annoyance and uncertainty, the only question being as to its possible extent.

That precautions such as those suggested by the Astronomer Royal would certainly palliate, and might possibly altogether prevent this evil from attaining

ing any sensible amount, there can be no doubt; but that this last result would be obtained by such precautions it is impossible to decide *à priori*. To render them effectual might require a diminution of speed and weight very inconvenient to the public. It appears to me, therefore, that it is worth considering whether some mode could not be devised of preventing the inconvenience altogether, so far as the Observatory is concerned, at the expense of a very trifling inconvenience to the company or the public.

It appears to me that this might be done by requiring the company to establish and maintain a line of electro-telegraphic communication between the two nearest stations and the Royal Observatory, on the communication of a peculiar signal, from which (perfectly distinct from every other recognized at the station) an embargo might be laid on any train about to start to continue during (say) one minute from the moment of the signal's arrival. In stating this idea as it occurs to me, I purposely avoid details, which would be easily supplied if carried out into practice.

But there is another cause of possible evil in a tremor kept up from year's end to year's end, viz. the unsettling by a slow and progressive, but unknown and probably irregular amount, the foundations of all the piers of the instruments erected on a mound of incoherent shingle and sand, by agitating the base of the hill itself. I know of no system of experiments which could be instituted to enable us to judge of the probable extent of such an effect, short of the registered result of actual observation under the circumstances.

Two considerations lead me to believe that this objection (which, when it first occurred to me, seemed formidable) may not, in fact, be of dangerous weight.

1st. An inequality of subsidence in a meridional direction would be eliminated by observations by reflection; and a similar inequality in azimuthal subsidence (which would be likely to arise from the difference of distance, however small, of the up and down lines of railway) would be detected and destroyed by constant reference to the meridian marks.

2d. The continual occurrence of storms, gales of wind, thunder claps, &c. &c., must necessarily keep the soil (if only by the agitation of the buildings, in a much more violent state of tremor than that induced by the proposed railway, causes which hitherto have not produced any serious impediment to good observing.

Conceiving that, under existing circumstances, time may be important, I reply forthwith to the honour of your communication. The subject will, however, of course, be brought under consideration of the visitors on Saturday next (their day of annual meeting), and in the interim I shall not fail to bestow all attention to obtaining distinct ideas on the subject.

I have, &c.

Captain Hamilton, R. N. (signed) *J. F. W. Herschel.*

No. 52.

No. 52.

Professor *Johnson* to Captain *W. A. B. Hamilton*, R. N.

Radcliffe Observatory, Oxford,
2 June 1846.

Sir,

On the subject of your letter of the 27th ultimo, stating that my Lords Commissioners of the Admiralty had done me the honour of requesting my opinion whether any mischief would ensue to the observations at the Royal Observatory in consequence of the line of the proposed North Kent Railway passing through Greenwich Park at a distance of 830 feet from the Observatory, I beg leave to state, that after a careful perusal of the documents which accompanied your letter, and the best consideration I can bestow on the subject, I entirely concur in the view taken by the Astronomer Royal.

I believe that little or no inconvenience will be felt, astronomically; certainly not of an extent which would justify the interruption of a great public undertaking.

For some years past, at this Observatory, we have been exposed to tremors, caused by the passage of machines of other descriptions within much less distance of our instruments, equal in extent and nearly equal in duration to

Correspondence, &c. relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

those shown by the Astronomer Royal's experiments on Kensal Green, and I have not found their essential adjustments to be in the slightest degree affected in consequence.

I have, &c.

Captain W. A. B. Hamilton, R. N., &c. &c. &c. Admiralty.

(signed) *M. J. Johnson*, Radcliffe Observer.

No. 53.

No. 53.

From Professor *Challis* to Captain *W. A. B. Hamilton*, R. N.

Sir, Cambridge Observatory, 3 June 1846.

I HAVE given the earliest attention I possibly could to the papers you transmitted to me relating to the effect of a proposed railway passing through Greenwich Park on the astronomical observations made at the Royal Observatory. After giving to the statements of the Astronomer Royal a very careful perusal, I feel desirous of offering, for the consideration of the Lords Commissioners of the Admiralty, a few remarks on the subject.

Not having at any time made experiments to determine the effect of tremor on astronomical observations, and the distance to which the effect extends, I can only express an opinion founded on my experience in the practice of astronomy, and in the usual operations of an observatory. I receive implicitly the results of the experiments of the Astronomer Royal, which appear to me to be very proper for determining the amount of disturbance to the observations at the Royal Observatory which would be caused by the railway tunnel proposed to be made through Greenwich Park. These experiments establish, what is well known to a practical astronomer, that a degree of tremor so small as to be quite inappreciable by other means is sufficient to spoil an observation taken by reflection at the surface of mercury.

I agree with the Astronomer Royal, that only one kind of observation would be injured by the proposed railway, viz., the observations made by reflection at the surface of mercury. But I am disposed to estimate, at a very large amount, the injury to this class of observations, and the practical inconvenience resulting from a railway passing the Royal Observatory at the distance of 860 feet, under the circumstances described in the Astronomer Royal's letters. My reasons are the following:—

The reflection observations are normal observations, and, therefore, of the utmost importance. Every observation made with the mural circle depends ultimately on such observations. The surface of mercury has been found in practice to give the zenith direction with much more convenience and precision than the plumb-line formerly used; and the adoption of the reflection method is considered one of the greatest improvements in modern astronomy.

By Mr. Airy's experiments, reflection observations would not be practicable at the Royal Observatory during the one minute and a quarter that each train occupies in passing. To estimate correctly the length of time during which the passage of a train would be an impediment to these observations, account must be taken of the time required for making preparation for the observation. From the commencement of the preparation to the securing of the observation, hardly less time than five minutes should be allowed; and as the train passes at an uncertain time and the star at a certain time, there would always be a risk of the two lines clashing, if the observation were attempted within an interval of five minutes from the expected arrival of the train. This interval could not be economically used for such a purpose. The observer would naturally prefer waiting till he is sure the train is gone. Considering, also, that a star proper for the purpose is not passing the meridian at every moment, and that the opportunities for reflection observations are not frequent,—clouds, or a very slight wind, often interrupting them after every preparation has been made,—I am of opinion, that, if to these obstructions be added the interruption, and the fear of interruption, from trains passing every quarter of an hour, this kind of observation could not be carried on. At all events, the observer, if he perseveres in them, must expect to make many abortive attempts at a great sacrifice of time and labour.

After stating these objections, I am bound to say, that the method of reflection of the wires of a telescope to determine the zenith direction (one of recent invention,

invention to which Mr. Airy alludes), is not subject to the above-mentioned inconveniences, being available at any time, and independently of a star. Probably this method may supersede the necessity of taking other reflection observations with a mural circle of six feet diameter, which is the size of that in the Greenwich Observatory. I have adopted it with a mural circle of eight feet diameter, and find that, with a circle of that size, it is highly desirable to take reflection observations of stars also.

And even allowing it to be not absolutely necessary to take reflection observations of stars, there are so many advantages in this mode of observing, that I should consider an observatory in which there was any impediment to the use of it to be, in some degree, crippled. It is at all times a ready test of the good action of the instrument, and the care and skill of the observer; and as it allows of taking two independent observations of an object at one transit across the meridian, it gives the means of securing a greater number of observations in a given interval of time than could otherwise be obtained. Possibly, in the progress of astronomical science, the same method may be applied to other instruments and in other ways, and, on this account, it is desirable that no hindrance be placed in the way of using it.

I would also submit, that if a railway be made to pass at the distance of 860 feet from the Royal Observatory, this may be taken as a precedent for other Observatories. I have been threatened with projected lines passing near the Observatory under my direction, and I do not hesitate to say, that if a line of large traffic passed within 900 feet of it, I should expect its efficiency to be very much impaired.

These remarks, which I have made without reference to the particular advantages to the public of the proposed line through Greenwich Park, of which I am unable to form a judgment, but solely from a consideration of the interests of the Royal Observatory, I beg you will do me the favour of submitting to the Lords Commissioners of the Admiralty, as the result of my attention to the subject on which their Lordships requested my opinion.

I have, &c.
(signed) *J. Challis*,
Plumian Professor of Astronomy in the University of Cambridge.

To Captain B. Hamilton, R.N.,
Secretary to the Admiralty.

No. 54.

No. 54.

From *Charles Babbage*, Esq., to Captain *W. A. B Hamilton*, R.N.

Dorset-street, Manchester-square,
3 June 1846.

Sir,

I BEG to acknowledge the receipt of your letter of the 29th May, with its enclosures, by which I learn, that the Lords Commissioners of the Admiralty desire my opinion on the subject of the probable effect on the Royal Observatory of a railway proposed to pass through Greenwich-park.

I presume this communication is addressed to me as one of the visitors of the Royal Observatory, and as I am aware that the question presses for an immediate decision, I proceed to give, as well as the time will admit, the opinion I entertain on the subject. It is founded chiefly on the observations of the Astronomer Royal, which are confirmed by other observations, and on my own experience on similar subjects.

(*a*). It appears, from experiments made by the Astronomer Royal, both in 1836 and 1846, that sensible tremors occur, under various circumstances, at from 1,100 to 2,200 feet distance from a railway. These are stated to be "the smallest which could be perceived with the best astronomical means," and they were doubtless made with a magnifying power at least equal to that in usual employment for observatons, by reflection at the Royal Observatory.* Some observations made by Mr. Hind, at Kensal-green, give 609 feet as the limit at which vibrations cease to be sensible; but when it is remarked that these latter observations were made by the naked eye without any magnifying

* I have since ascertained from the Astronomer Royal that the power of the telescope employed in these observations was not so great as the power usually employed in the Greenwich instruments: the force of the argument in the body of the letter, therefore, acquires greater weight.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

nifying power, they confirm rather than conflict with those of the Astronomer Royal.

(*b*). The proposed railroad approaches within about 770 feet of the Royal Observatory, and *must*, consequently, *sensibly* affect a "*very important class of observations.*"

(*c*). Of the effect of such vibrations on clocks and on chronometers, I have no experience, nor have I access to any experiments.

(*d*.) It seems possible that vibrations may have some effect in making the pivots of some instruments sink slightly in their Y's after each time they have been moved ; but this, if possible, may not be attended with inconvenience.

(*e*). It is also to be considered, that the iron of trains and of the railway itself, may have some slight effect on the Magnetic Observatory, more especially as the delicacy of certain of these observations may, by peculiar means of observing, be almost indefinitely increased.

(*f*). The strong electricity produced by steam issuing from an orifice (a fact but recently known), may also have some influence on the registers of electricity.

(*g*). But whoever should undertake to give an opinion in the proposed question without looking forward to the probable advance of science and of the mechanical arts during the next few years, at least, would omit a most important consideration.

Similar neglect upon two recent questions (the proprietorship of railroads and the magnitude of the gauge), have already caused a useless expenditure of millions, and promise a still greater waste before those errors can be repaired.

The progress of science has a continual tendency to demand an *increase in the accuracy* of astronomical observations; tremors that are now innocuous, may, in a few years, seriously interfere with improved means of observing.

The advance of commerce and of the mechanical arts, is urged on by far more powerful influences than those which, in this country at least, are applied to science. This advance can hardly fail, within a very few years, to produce heavier engines and longer trains as well as their more frequent recurrence.

On these grounds, I am decidedly of opinion, that it is highly inexpedient, even at present, that any railway should pass as near as the one proposed to the Royal Observatory; that if it should now be permitted, the value of future observations will be seriously impaired, and a necessity will probably arise for removing the whole establishment to a less exposed situation.

With reference to any plan that may be proposed for stopping trains or for limiting their speed and weight, I believe, that if the railway is once made, they will soon be found to be *wholly inefficient*.

I am, &c.

Captain W. A. B. Hamilton, R.N., Admiralty. (signed) *Charles Babbage.*

No. 55.

No. 55.

From Right hon. *H. T. L. Corry* to the Marquis of *Northampton.*

My Lord, Admiralty, 4 June 1846.

My Lords Commissioners of the Admiralty having been given to understand that your Lordship and the Board of Visitors intend to proceed on a visitation to the Royal Observatory on Saturday next, direct me to forward to you the enclosed copies of the opinions of certain distinguished scientific persons who have been consulted on the subject of the effects which may possibly be produced by the passing of trains within a certain distance of the Royal Observatory, and my Lords earnestly request that your Lordship, as President of the Royal Society and Board of Visitors, will have the goodness to take the whole subject into consideration, and favour my Lords with your opinion thereon. I am also directed to transmit a copy of a Report from Commander Denham, R.N., of the experiments made by him at the tunnel at Liverpool.

I am, &c.

(signed) *H. Corry.*

To the Most Noble the Marquis of Northampton, President of the Royal Society.

No. 56.

No. 56.

Correspondence, &c., relative to the probable effects on the Royal Observatory of any Railroad passing through Greenwich Park.

From *T. R. Robinson*, Esq., to Captain *Hamilton*, R. N., &c.

9, Hume-street, Dublin,
3 June 1846.

Sir,

I HAVE been delayed in answering your letter of May 27, partly from the press of some indispensable business, and partly by the necessity of giving an attentive consideration to the documents which you have forwarded to me, and on which the Lords of the Admiralty request my opinion.

The question which is discussed in them has been long familiar to me; it was forced on my mind several years since, when the Ulster Railway was before Parliament, and again last year, while an extension of that Line was in progress through its Committee.

The conclusion at which I arrived, is widely different from that of the Astronomer Royal; and I am compelled to say, that my conviction of its correctness is strengthened, instead of shaken, by examining his arguments. It would require too much space and time to give my reasons in the full detail which would be necessary to persons who are not professional astronomers; but if any part of the following remarks require fuller explanation, I shall be happy to afford it.

Mr. Airy does not attempt to deny that the proposed railway is likely to be a troublesome neighbour; but he thinks the Lords of the Admiralty had better submit while they can obtain terms, even though indifferent ones, for the Observatory; because in a few years the cry of Woolwich for a short cut to London will be too powerful for them or any other department of Government to resist: on this extraordinary suggestion, which seems to me little better than a sacrifice of principle to expediency, it is only needful to remark, that its application will not be limited to Greenwich Park.

If their Lordships act on it in this instance, they give a death-blow to some of their most important privileges; the precedent of yielding to this kind of clamour once being established, they will find it impossible to preserve from ruin any river or harbour in the realm which a railway company may think it convenient to sacrifice; nor can I even admit the supposed necessity of such compromise; it is directly contradicted by my own experience. When I stood forward in defence of the Armagh Observatory, I was cheered in every direction by the prompt assurance of aid.

Men of the most opposite parties agreed in this, and the Committee granted the limit of distance which I required (700 yards) without a dissentient voice; but how much more powerful is the claim of the Royal Observatory?

Before proceeding to examine his other arguments, let me notice a principle which I think most astronomers consider self-evident, namely, that wherever tremors can be *perceived*, they should be *prevented*: they cannot possibly do good; in many cases, probably in all, they do harm. However slight each individual vibration may be, their effect accumulates with time, till results are produced which seem utterly disproportioned to their cause.

As familiar examples of this, the flute or violin which have been long in use acquire a tone which they did not originally possess; the engine-axle, once a bundle of tough iron fibre, becomes a mass of scarcely cohering crystals by continued vibration. One possible occurrence of this kind is sufficiently obvious; slopes of earth which, under common circumstances, would stand for ever, are soon brought down by the repeated passage of a train; might not a similar, though slighter disturbance, affect the hill on which the Observatory stands, composed as it is of incoherent gravel, and rising more than 100 feet in the proposed distance? We know that when Flamstead erected his mural arc there, he was embarrassed by a gradual sinking of the wall, which went on progressively for many years: it has not, as far as I know, been ascertained when this ceased, but assuredly the proximity of a railroad is very likely to reproduce it; and why hazard the recurrence of such an event?

Let it also be kept in mind, that even were we sure this railroad could produce no error which the *present* methods of observation can discover, yet we are not warranted in limiting the *future*. New methods may, and probably will be invented, surpassing our means as far as the mercurial horizon is superior to the arc of Flamstead. Let us not, therefore, do any thing which may make it impossible

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for any future Astronomer Royal to transcend the present one. But the fact is, it will actually interfere most seriously with *all* the existing kinds of observation; and I can only account for Mr. Airy's assertion to the contrary by supposing, that as he has not been an habitual observer with transit or circle for many years, the minute details which are essential to the accuracy of such work may have escaped his memory. He states, that "the tremors in question would not produce any effect whatever upon chronometers, upon transit observations, direct circle observations, upon equatorial observations, or, in fact, upon any class of observations but one." As to chronometers, this doctrine is inconsistent with my own experience, and that of all the naval officers with whom I am acquainted. The precautions which are taken in carrying them, and the difference between their rates when travelling and stationary, show that they *are* affected by tremors. When Mr. Dent very kindly determined the longitude of Armagh, some years since, by fifteen of his admirable chronometers, he thought it necessary to carry them on his knees the whole of the way from London, though all possible skill had been employed in packing them; but, of course, on this point their Lordships have consulted their hydrographer, a much more competent authority than any mere astronomer. Clocks, still more important in an observatory, are also liable to be disturbed. My transit clock, one of the best ever made, changes its rate a little when the ground on which the Observatory stands is shaken by the action of high winds on the buildings, or when the machine is at work on which I polish my 15-inch specula, though the jar which it causes is exceedingly slight, and it stands in a separate apartment.

As to transit observations, I must remind their Lordships that these consist in observing the passage of a heavenly body over fine lines fixed in the focus of a telescope, while the time is noted by counting the beats of a clock. Eye and ear must act together with the utmost precision, and therefore any noise or disturbance is most injurious. Even the uneasiness produced by expecting a train will cause a distraction, to say nothing of the uproar of its actual passage; and I assert in the most positive manner that stars observed under such circumstances are neither comparable to those taken when the observer is undisturbed, nor of the same probable value.

It must also be remembered, that in this work the clock error must be determined by observing as frequently as possible a few standard stars; these must be taken as they pass, and the disturbance caused by a train must of necessity often interfere with them, as they are on the meridian about four minutes earlier each day. Much of this applies with equal force to occultations, eclipses and comparisons of clocks. But there is another, even perhaps a greater evil; the worth of these transit observations depends on the instrument's power of retaining certain adjustments for a considerable time. These are made in general by slides moving very steadily by means of screws to a certain position, and fixed there, or some similar arrangement. Now the tremors produced by a railroad are specially unfavourable to any stability which depends on friction; in particular they loosen screws in a way which is quite surprising to one who is not familiar with practical mechanics. A balance will turn with a much less difference of weight if its support be slightly jarred, and a brake which just keeps a weight from running down, will let it escape when a train passes even at some distance; what, then, will be the result when this vibration acts on joints and bearings where the tenth of a hair's breadth is of consequence?

This also applies to the circle with an additional force, for that instrument is liable to an error which these tremors must increase. In moving it to bisect a star, the friction of the centre puts the spokes of it and the clamp into a state of strain, from which they sometimes release themselves while the microscopes are read off. This has been noticed by Bessel and Struve, as well as myself; it is probably not very injurious under uniform conditions and with proper precaution, but it is to be expected, from what I have already mentioned, that the influence of passing trains will materially increase its mischief.

What I say of circles applies to equatorials in a high degree; they keep their adjustments worse, and are much more unsteady. I have seen one vibrate so as to prevent vision of a double star when an omnibus was passing at twice the proposed distance, 253 yards.

There

There remains "the one class of observations" which Mr. Airy admits may be affected by the vicinity of a railroad,—those made by reflection in mercury; these, as he truly says, are "very important," so much so that without them all other circle observations are useless, because they require a correction which, in fact, *these alone can give*. This indisputable point ought to be decisive against whatever can, even by possibility, interfere with them. If "six of this class," or even "fewer," are now considered "sufficient on a fine evening," I am sorry to hear it; for the practice was far different at Greenwich in former times. Even were the stars observed at the same altitude, and if we might venture to assume the permanence of the instrument for many days or weeks, I think this number not "sufficient," much less when ground piers and circles are shaken by continual vibrations. But Mr. Airy himself has shown that the correction given by these reflection observations is different at different altitudes. The cause of this is not fully known, but it clearly indicates the necessity of increasing their number under varying conditions of temperature and molecular arrangement. It is almost needless to remark, that in stormy weather they cannot be made with advantage, but that even then lulls occur, when they may be obtained *if a train is not passing*. With respect to "the apparatus for observing by reflection the wires of a circle telescope" (and which, I believe, I have used more than any one), I can assure their Lordships it is even more sensitive of tremors than the reflected stars, requiring exceeding caution in the observer's motions. An imperceptible tap on the massive pier, the step of a man at sixty or seventy yards, or the passage of a at 300, disturb it completely; the indistinctness continues with me longer than was the case in Mr. Airy's trials, owing probably to the high power (250) which I used, and if there be the least wind it lasts for *many minutes*. Not even in perfectly calm nights is it possible to make in less than 20 minutes the observations which I consider necessary, for the very touching the clamp produces agitation, and if it blow fresh, I have to watch for a moment of repose. Therefore no dependence can be put on this as being practicable near a railroad. After this, it is scarcely necessary to notice the experiments at Kensal Green, except by observing that they are in fact decisive *against* the railway.

Without dwelling on the weak optical means used (a telescope of 30 inches focus, magnifying perhaps 60 times, that of the Greenwich circle being six feet), or the want of all information as to the size of the mercurial trough, or the position of it and the wires of the telescope with respect to the rails, though these influence materially the amount of undulation; without discussing Mr. Stephenson's suggestion, that "these tremors are propagated by the air rather than the earth" (which we have ample means of disproving), or the notion "that they are much diminished by a tunnel" (which is at least doubtful), the actual existence of these tremors, in one instance at 2,200 feet distance, is shown in a way not to be gainsayed by counsel or engineer. That once established, most astronomers of Europe will, I think, join me in saying nothing remains possible except uncompromising opposition from the guardians of this Observatory. Mr. Airy might indeed have removed his instruments from the line till he found the distance at which no agitation could be seen, and fixed that as the limit of approach; but even then the noise would, as I have already stated, be a fatal objection.

I need not apologize for this long letter. This Observatory holds such a place in the history of science, that I regard as a national calamity whatever lessens its efficiency, or even throws on its excellency a suspicion. Hitherto it has been confessedly *the first Observatory in the world*; a distinction which it owes, not merely to the excellence of its instruments, or the talents of its directors, but to the long and unbroken continuity of its system, to the perpetual superintendence of the Admiralty (which I trust they will never intermit or delegate), and, above all, to the powerful impression of that national truth and integrity, that "*probité austère*," our proudest boast, which is so deeply stamped on its proceedings. They only who are familiar with the astronomical literature of the last century can conceive the reverence, I might say the adoration, with which this establishment was regarded by foreigners, or the implicit confidence which was commanded by its results. This will assuredly no longer be the case if the proposed encroachment be successful. The evils to which I have pointed, sufficient in themselves, will be caught eagerly, perhaps exaggerated, on the continent; the motives

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motives of those concerned in it will be distorted or misrepresented, and, it is to be feared, the nation itself which tolerates such an outrage, will be described as one prepared to sell any thing, even its honour.

I have, &c.

Captain Hamilton, R.N.
&c. &c. &c

(signed) *T. R. Robinson.*

No. 57.

No. 57.

EXTRACT from the MINUTES of the PROCEEDINGS of the BOARD of VISITORS of the ROYAL OBSERVATORY at *Greenwich*, at the Visitation of that Establishment, on Saturday the 6th of June 1846.

A LETTER addressed by Dr. Robinson to the Lords Commissioners of the Admiralty on the subject of the proposed railway through Greenwich Park having been submitted to the consideration of the Board of Visitors by their Lordships; and the Board of Visitors having further heard from the Astronomer Royal the reports on the subject of the same railway addressed by him to their Lordships, it was resolved, that it is the opinion of the Board no very serious inconvenience would probably result to the observations from the passage of a railway in a tunnel of the distance of 850 feet from the observing rooms, provided that provision is made for regulating the speed and weight of the railway trains in their passage near the Observatory, and also that a power of stopping the trains altogether be reserved with the Astronomer Royal during the time when important observations are in progress. But the Board beg leave further to observe, that this question has been brought under their notice so suddenly that they have not been enabled to give it that deliberate consideration which its great importance deserves.

An amendment was moved by Mr. Babbage, and seconded, that the words "no very" (no very serious) be omitted, and also the whole of the paragraph about stopping trains, &c. be omitted. This amendment was put, and negatived.

A second amendment was moved by Sir John Herschel, that instead of the last paragraph, beginning "But the board beg leave," &c., the following be substituted, "But the board beg leave further to observe, that the circumstances are so new, the advance of science so rapid, and the attention of astronomers so constantly directed to more and more minute corrections, that, brought as the subject has been suddenly before them, they are by no means disposed to give a decided opinion of the entire absence of prospective danger, in what they feel to be rather a matter of experience than of opinion." This amendment was also negatived.

No. 58.

No. 58.

MEMORANDUM.

Admiralty, 10 June 1846.

THE Admiralty have given due consideration to these conflicting opinions, and although they have the greatest confidence in the opinion of the Astronomer Royal more particularly charged with the observations at the Observatory, and of course, perfect reliance on the correctness of the decision of the majority of the learned Visitors of that institution, yet as persons of distinguished ability, whose opinions are entitled to be received with deference, have given such strong and decided contrary reports on the subject, the Board, however unwilling to deprive the public of what is considered by them an important accommodation, deem it to be on the whole most prudent to withdraw their sanction to the tunnel through Greenwich Park for the proposed railway being proceeded with, at least until another Session of Parliament, when further experiments may induce a more concurring opinion as to the real effects such a measure will have on an Observatory situated at the distance stated from such railroad tunnel.

By command of their Lordships,

(signed) *W. A. B. Hamilton.*

Admiralty, 10 June 1846.

H. F. AMEDROZ, Chief Clerk.

GREENWICH PARK

COPIES of Correspondence, Reports, &c. on the Subject of any Railroad passing through Greenwich Park, and its probable Effects on the Royal Observatory.

(*Mr. Hume.*)

Ordered, by The House of Commons, *to be Printed,*
10 *June* 1846.

[*Price* 6*d.*]

375.

Under 8 *oz.*

GREENWICH PARK.

RETURN to an ADDRESS of the Honourable The House of Commons, dated 23 June 1846;—*for*,

"COPY or EXTRACT of REPORT of Sir JAMES SOUTH to the ADMIRALTY, dated on or about the 22d instant, on the probable Danger of any Railway passing within a given Distance of the ROYAL OBSERVATORY, GREENWICH (in continuation of Parliamentary Paper, No. 375, of Session 1846)."

TO THE RIGHT HONOURABLE THE LORDS COMMISSIONERS OF THE ADMIRALTY.

My Lords, Observatory, Kensington, 22 June 1846.

UNDERSTANDING, from papers published by Order of The House of Commons, that the interests of the Observatory of the Nation, the Royal Observatory at Greenwich, have been threatened with danger, perhaps with ruin, by the passage of a railway distant from it only 860 feet, and finding, from the same authority, that "The Admiralty have given due consideration to these conflicting opinions" (meaning the conflicting opinions of different persons which have come to the Admiralty's knowledge), "and although they have the greatest confidence in the "opinion of the Astronomer Royal, more particularly charged with the obser- "vations at the Observatory, and, of course, perfect reliance on the correctness of "the decision of the majority of the learned visitors of that institution, yet, as "persons of distinguished ability, whose opinions are entitled to be received with "deference, having given such strong and decided contrary reports on the sub- "ject, the Board, however unwilling to deprive the public of what is considered "by them an important accommodation, deem it to be on the whole most "prudent to withdraw their sanction to the tunnel through Greenwich Park for "the proposed railway being proceeded with, at least until another Session of "Parliament, when further experiments may induce a more concurring opinion "as to the real effects such a measure will have on an Observatory situated at "the distance stated from such railroad tunnel;"—may I, without giving offence, transmit to your Lordships, a statement of some experiments and observations which I have recently made, and which, had they been known to your Lordships, would, I think, alone, have justified you in refusing that consent which you have once given to the scheme, and will also (if I mistake not) justify you at any future time in refusing to renew it.

On Wednesday, May the 13th, Mr. Peters and Mr. Whitmore, directors of the North Kent Railway, called here as a deputation from the Board of Directors of that Company, and officially notified to me, that "as I would *not* communicate "to them my opinion as to the probable effects on the Greenwich astronomical "observations of railway trains passing within 860 feet of the Royal Observa- "tory, in order that they (the directors) *might* examine me before a Committee "of the House of Commons then sitting, if my opinion were favourable to their "company's interest—or decline doing so, if it were adverse—they had deter- "mined to examine me, be the consequences what they might:" "That as "they found I sternly refused attending any Committee sitting, or which might "sit on the matter, unless compelled by Parliamentary interference, they (their "co-directors and themselves) were resolved to apply for that interference, and "thus enforce my attendance;"—I thought it advisable to make a few experiments on the subject.

Before, however, I describe them, it is indispensable for me to state of my transit circle, that its telescope is three inches and three quarters aperture, and

its focal length 62 inches; it lies between two *divided* circles, each of four feet diameter, and no star's declination which *here* gives to it a meridian altitude between 4 and 86 degrees, is considered properly determined, unless it is observed by *reflection* and direct vision at the same meridian passage, all the 12 microscopes of the circles being read off at each observation. The magnifying power usually employed is 250; but the object glass of the telescope is very perfect, and will bear a power of 520.

Again, The telescope of my transit instrument is 4 inches aperture and 86 inches focal length. The magnifying power generally employed is 250, but it will bear a power of 600 whenever the night is favourable, and it is desirable to use it.

Lastly, The telescope of the Greenwich mural circle is four inches aperture and six feet focus. What the magnifying power ordinarily used is, I do not know; I may, I believe, safely say it does not exceed 250. The circle is furnished with six microscopes, and the instrument, as well as those of mine before alluded to, was made by Edward Troughton.

The same night, therefore, placing my ordinary reflection apparatus in the meridian of my transit circle, I found,—

1st. That with the magnifying power of 250, the tremors arising from omnibuses passing in the high road were perfectly perceptible, although the least distance of the road, from my transit circle, was about 418 yards.

2dly. That on bending the second joint of my fore-finger, and with it *gently* tapping the top of the steps on which I was standing to observe the pole star, the mercury was immediately agitated.

3dly. That an assistant tapping in a similar manner the floors of the circle, the equatorial, the transit, and the large equatorial rooms, the effect was in every instance sensible; although the centre of the last room is distant from the mercury 65 feet, and there are four 9-inch and one 18-inch brick-walls between them.

As, however, "gentle tappings" are of very indeterminate force, from the top of the observing steps (62 inches above the floor), I repeatedly let fall, on the ordinary floor of the room (which is perfectly detached or insulated from that part of it on which the mercurial apparatus rests), a shilling, and the image of the pole-star, which till then, with a power of 250, was perfectly round and steady, became a sprawling and amorphous patch. I next dropped shillings, one by one, on the top of the observing steps, from a height only five inches above it, and even *then* the effect was destructive of the star's image.

Thursday, May 14th.—My reflection apparatus, when in use, is *perfectly* insulated, not only from the surrounding floors and walls, but also from the piers which support the instrument, as well as from the massive stone which carries the piers, whilst the mercury trough at Greenwich is (I believe) principally used on a shelf attached to the pier which carries the Greenwich instrument: in order to imitate the latter as far as I could, the flooring was taken up, and the reflection apparatus planted on masonry erected for the purpose on the block of stone weighing about 18 tons, serving for the base of the stone piers on which the instrument itself is placed. This also gave me the opportunity of *convincing* myself that the insulation of the reflection apparatus from the walls and floor of the observatory was *complete*. In the evening, the experiments of the preceding night were repeated, and with precisely similar results.

In the large equatorial room there is a monster pyramidal pier, containing above and below ground some hundred tons of brick and stone work. An assistant gently tapped it; the tremors disturbed the image of the star, although the mercury rested on some six and twenty tons of solid masonry, was at 64 feet distance, and the tremors took almost half a second of time to arrive there.

The mercury vessel hitherto used here is similar to that which (I believe) is used at Greenwich, and is a rectangular mahogany trough of about five inches wide, by 18 inches long and one inch and a half deep (inside measures). At Greenwich, the trough was, and I believe still is, placed lengthwise on the shelf, so as not to be offensively to the eye out of the meridian. Here the apparatus renders it impossible for the trough to be otherwise than in the plane of the meridian.

Let

Let us now suppose the image of a bright star reflected from the mercurial surface to be in the field of the transit circle. So long as the mercury is strictly quiescent, the star's image is seen perfectly round and steady (for this and similar phenomena, *vide* Diagrams and Explanations at the end of this Report); but the instant a little wind or tremors from other cause, disturb the mercurial surface, the star breaks up into, or seems to throw out, on the east and west, several stars, all smaller than itself, and equinumerant on each side, of which the largest is nearest to the original, or to the place which it occupied; and the smallest is the most remote, and the whole very much resemble a string of beads. They present specimens of all magnitudes of stars between the 1st and 10th or 12th: at equal distances from the parent star on either side, their magnitudes are equal. Occasionally some of them are as blue as the small star of β Cygni, and furnish not only an agreeable but even an amusing object.

If, as at this observatory, the centre of the mercury-trough is exactly in the meridian of the circle, and the surface of the mercury is ruffled, whilst the original or parent star is bisected by the declination wire of the instrument, *then* every one of these off-set stars (and I have counted 22 of them) will be bisected by it also. Hence that the trough be placed in the plane of the meridian, is in the highest degree important; for if it be so, this line of stars scarcely, if at all, prejudices the observations made in declination.

But if the tremors be considerable, a nebulous wisp—a cross studded here and there with extremely minute stars—a double or triple row of stars occasionally inosculating with each other—an irregular group of stars of variegated colours—or an amorphous patch of light—present themselves, unless all vestige of any object in the telescope disappears. This last, strange as it may seem, is scarcely more inimical to accurate observations than are the phenomena before mentioned.

But these various images are usually very transient, for one seems scarcely formed before it is succeeded by another: in 20 seconds of time I have noticed more than 20 metamorphoses; I will therefore not attempt to describe them, for to be understood, they must be *seen*.

Let us now place the long side of the trough *perpendicular* to the meridian, the telescope pointing to the centre of the mercurial surface, and we shall find that the *slight* tremors *now* will throw the line of little stars, whether single, double or triple, *not* east and west, as formerly, but *north* and *south*; the wisp will also be similarly situate.

Inclining now the trough at half right angles with the meridian, and directing the telescope to the centre of the mercury, I found that the single double or triple rows of stars—the crucial image of them—or the nebulous wisp—were each disposed at the same angle, namely, 45 degrees, with the declination wire of the instrument.

Finding these facts, I substituted a circular vessel of 11 inches diameter for the rectangular trough; directing the telescope to the centre of the mercury contained in it, the pole star with a power of 250 was beautifully defined; and its accompanying small star so perfectly distinct, that I could (had I wished it) have taken its distance from, and angle of position with, the larger star micrometrically; and I found (as I expected) that under slight tremors the *large* star, instead of breaking up into or seemingly generating *small* stars, remained *entire*, whilst a series of very close concentric rings around it gave to the image in the telescope the appearance of a stellar nebula; it was also *evident* that tremors, which in the long rectangular mercurial trough would have been *destructive* of all observations, were *now* of little consequence. Thus, then, all obstacles to observing transits of stars by reflection, which had *hitherto* been despaired of, vanished; for turning my instrument on ϵ Bootis, I not only saw it double, but took the transit of the large star with a power of 520 without difficulty, although the wind at the time caused all the unprotected lights in the observatory to flare offensively.

Vessels, oval, square and polygonal were subsequently tried; but as the image reflected from the mercury contained in *them* presented annoying optical appendages from which it is exempt when reflected from the surface of the mercury exposed in a *circular* vessel, it would be useless here to narrate the experiments; I will, however, state, that I do not think the *depth* of the mercury has any important effect on the mobility of the mercury, for whether the latter was the eighth of an inch or half an inch deep, seemed perfectly immaterial.

On Sunday, May the 24th, Dr Robinson, Director of the Observatory at

Armagh, was here ; I showed him the experiments. Being much delighted with them, he urged the propriety of my transmitting an account of them to your Lordships, and perhaps your Lordships will censure me for not following his advice. My only apology for not doing so is, fears which I entertained that your Lordships would *then*, perhaps, have regarded such a course on my part as an impertinent intrusion. In further extenuation of my conduct (should such be necessary), in a letter to Mr. Hume, I had invited *that gentleman, and any of his Parliamentary friends*, to come to Campden Hill, and "*propriis personis*" see the observations.

On Monday evening, May 25, Sir Benjamin Brodie, being at the transit circle witnessing the experiments, Sir Robert Inglis, most unexpectedly on my part, entered the Observatory, having, as he told me, "but just quitted the "House of Commons, *expressly* for the purpose of seeing the experiments, of "which he had heard but an hour ago, though *not* from me." Having seen them all, he took his leave of me, "to return to the House of Commons, and "there to mention them to Sir Robert Peel;" and I doubt not they were uppermost in Sir Robert Inglis's mind, when in the House on the following night (May 26), "he wished to know from the Right Honourable Baronet at "the head of the Government whether he had any objection between this and "the revival of the debate on the North Kent Railway, to authorize the Admi- "ralty to take measures to prove or disprove the truth of the assertion respect- "ing the injurious effect of the proposed tunnel through Greenwich Park upon "the Observatory?"

I have also great reason to believe, that the *impression* which Sir Robert Inglis's report of them had made on Sir Robert Peel's mind mainly operated, when in reply he said, that "communications he had received during the last few days "led to doubts whether the accuracy of the observations at the Greenwich "Observatory might not be affected by the proposed tunnel," and that "he "would communicate with the Admiralty on the subject, in order that every "necessary investigation might be made before the Bill was proceeded with." —(*Vide* "Times," May 27th.)

Having now procured a circular wooden vessel of 18 inches diameter, on the 4th of June, I began, with my transit *instrument*, a regular series of observations by *reflection*, as well as by direct vision, and have continued them to the present day: in one evening, as well as other stars by direct vision, I have observed 23 by reflection; and such of your Lordships as are practical astronomers will form some idea of the facility with which these transit observations by reflection may be made, when I state, that amongst them were the two stars ε Bootis and α^2 Libræ, although the latter *reaches* the *first* wire of the instrument only 156 seconds after the former has *passed* the *last*. I have, therefore, no hesitation in saying, that no star's right ascension is *properly* determined unless founded on the mean of observations taken by reflection and direct vision.

If this principle be acted upon, as I hope it will, the *enormous* discordance between the differences of right ascension of Sirius and Fomalhaut, as determined by the late illustrious Bessel on the one hand, and on the other by the assistants at the Royal Observatory of Greenwich, will be explained, and perhaps corrected; for we shall no longer act as if we *thought* that although the declination instrument required watching, on account of its flexure in declination, that the transit instrument had *none* in right ascension. Again, the transit instrument of Bradley, which had its share in contributing at Greenwich to those observations of which the immortal La Place says, "*Le grand nombre de ces "observations et la précision qui les distingue font de ce recueil l'un des principaux "fondemens de l'astronomie moderne, et l'époque d'où l'on doit partir maintenant "dans les recherches délicates de la science,*" (Précis de l'Hist. de l'Astronomie, p. 106); whilst Bessel has built on them an imperishable work, and confers on them a title of which Englishmen may *well be proud*, "FUNDAMENTA ASTRONOMIÆ."

But the transit instrument of Bradley was known to be *imperfect* by Maskelyne, as well as Pond. Experiments were made by Maskelyne, by Firminger (his assistant at the Observatory, in whom Maskelyne had the utmost confidence), by Troughton, and by Pond, to detect the nature of the errors, so that to the observations they might apply corrections. But although levels differently constructed, and plumb lines differently suspended, were appealed to in the presence and absence of the various artists who had been employed to furnish

furnish them, every one of these experiments gave results which differed from the rest. The task was, therefore, given up as hopeless, and the instrument was used with all its faults, till the year 1816, when the present one was substituted for it. Had observations by reflection been instituted, the result of the inquiry would probably have been successful.

The Astronomer Royal's experiments and observations narrated in the Papers published by order of the House of Commons I will not *here* criticise. Having, however, made (as I believe) in one night more pairs of observations of the declination of stars by direct vision and reflection than any other astronomer, and those, too, with an instrument declared to be equal to the Greenwich instrument by the late Mr. Troughton, the maker of both, I cannot withhold from your Lordships, that whilst the Astronomer Royal, " on a fine evening, thinks it sufficient to secure six observations of this class," (meaning observations with the Greenwich circle by reflection), my observations (made, be it remembered, 12 years ago, and therefore before this railroad scheme could prejudice my sentiments,) will demonstrate *that even* 22 *pairs were not enough.*

One word more, and I have done. The Royal Observatory at Greenwich is intended for *celestial* observations, and has been fitted up with instruments of considerable power, at considerable expense to the country. Experiments, therefore, made for the purpose of determining the probable effects of any disturbing force introduced near it, *ought*, in order to have any real weight, to be made on *celestial* objects with instruments at least of equal power with the Greenwich instruments, and mounted in a manner resembling the mountings of the instruments in general use at Greenwich. They should also be erected at stations geologically similar with that of the Observatory itself. It would seem, however, that the Astronomer Royal is of a *different* opinion.

Such are the observations and experiments which, had I followed the advice of my scientific friends, I should at an earlier period have had the honour of presenting to your Lordships. My opinions may be erroneous, but they are honest; they are neither known to the directors of the one company, nor to those of the other; although directors of each company have in my own observatory expressed *great anxiety* to know them. *I have* not, never *had*, and never *will* have, a single shilling embarked in *any* railway whatsoever; and the allusion to me in the advertisement of the North Kent Railway Company, which appeared in the "Times" of Wednesday, June 10, and which would *brand* me as a railroad partisan, is most unwarrantable. My conduct throughout the matter is known to Mr. Peters and Mr. Whitmore, as directors of the North Kent Railway, and to Viscount Torrington, as chairman of the South Eastern Line, and to them I may safely refer your Lordships for the vindication of it.

To the observations of *right ascension made by reflection*, the more immediate object of this communication, let me then entreat your Lordships' serious attention, convinced, as I am, that, did they stand *alone*, they would justify your Lordships in saying to *present* as well as to *future* railroad applicants, " WITHIN " THIS PARK STANDS THE ROYAL OBSERVATORY OF ENGLAND, AND WITHIN THIS " PARK'S WALLS A RAILROAD SHALL NEVER COME."

I have the honour to subscribe myself,

My Lords,

Your Lordships' most obedient servant,

J. South.

P.S.—I have Mr. Warburton's authority for stating, that he mentioned some of the experiments and observations here detailed in his speech in the House of Commons on the subject of the proposed Railway on Monday the 15th instant, although no report of what he said is given in the *Times* or other papers.

Memorandum.

Observatory, Kensington, 28 June 1846.

Being dissatisfied with all the experiments which have been made on the subject of Railway tremors, as likely to affect the observations at the Royal Observatory, I applied to Mr. Sellon, the occupier of the field near the Kensal-green tunnel, for permission, as soon after the grass was mowed as would suit his convenience, to erect, from about eight feet below the surface under the very spot on which the Astronomer Royal made his experiments, a solid mass of brickwork, resembling in size and form that of the masonry on which my transit instrument now stands in my observatory. I also requested his authority to place over this brickwork a temporary wood building about 20 feet square, provided with a floor, a brick pier for a clock, shutters in the roof, and other conveniences for observing in it with my transit instrument, right ascensions by *reflection* as well as by direct vision; *all expense* of erecting the same and restoring the ground to the state in which I found it being defrayed by *myself*.

Although I had not the honour of personal acquaintance with Mr. Sellon, and had no other introduction to him than that which the importance of the object I had in view procured for me, he received me with the greatest politeness, and expressed not only his willingness, but even readiness, to oblige me. "Absolute "permission, however, as he was only a tenant of All Souls College, Oxford, to "whom the freehold belonged, he could not at once give me; for, by his lease, "whatever building was erected on the ground he was compelled to leave there;" but he assured me he would write to the Bursar of the College, requesting that, as the representative of the College, he would sanction the transaction. Yesterday evening, however, I received a note from Mr. Sellon, accompanied by one which the Bursar of All Souls College had transmitted *him*, stating that "he cannot comply with Mr. Sellon's request in permitting Sir James South to erect a temporary building on Mr. Sellon's land on the Harrow-road."

Thus, then, my intentions of demonstrating the accuracy or inaccuracy of the inferences arrived at by the Astronomer Royal from his experiments made at Kensal-green are frustrated; and whether it is worth while for me to undertake at Watford (a station which Mr. Warburton regards as very much resembling, geologically, that of the Royal Observatory) the observations I contemplated making at Kensal-green, my knowledge of the present state of this Railroad affair does not enable me to determine.

Should, however, your Lordships think that any instruments I have, if transferred to other hands, or any observations I can make with them *myself*, can in the least aid your Lordships in arriving at just conclusions on this important subject, I will with the greatest pleasure transmit the former to any persons you may think proper to confide in, or I will cheerfully undertake the latter, be they what they may.

J. South.

DIAGRAMS.

DIAGRAMS OF STELLAR IMAGES

as seen by reflection from the surface of Mercury and alluded to in the preceding pages.

Fig 1

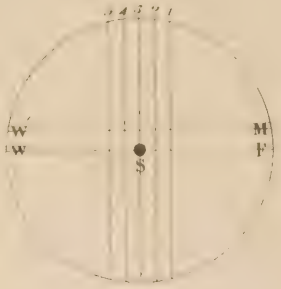


Fig 2

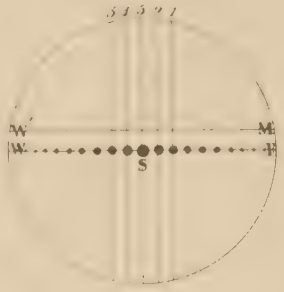


Fig 3

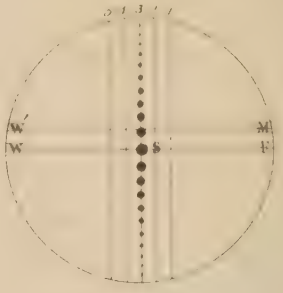


Fig 4

Fig 5

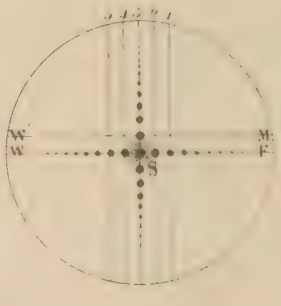


Fig 6

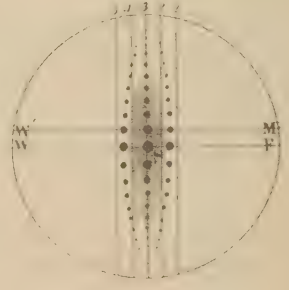


Fig 7

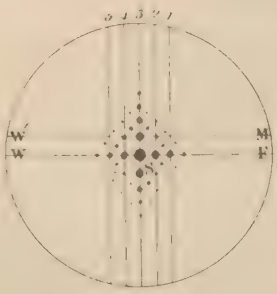


Fig 8

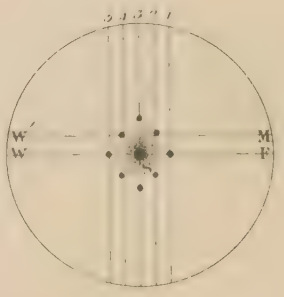
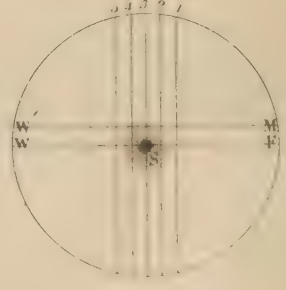


Fig 9



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EXPLANATION OF THE DIAGRAMS.

In each figure, the circle represents the field of the telescope.

F. W., the fixed or declination wire; M. W., the moveable or micrometer wire; 1, 2, 3, 4, 5, represent the five right ascension wires; and S. indicates the star (never less than one of the second magnitude) in the centre of the field.

Fig. 1 shows the star's image as reflected from the surface of mercury when in a state of absolute quiescence.

In the subsequent figures the mercurial surface was agitated by the wind or by tremors of some other origin.

Fig. 2 shows the image when the mercury is contained in a wooden rectangular trough, 18 inches long and 5 inches wide, and when the trough lengthwise is *in* the meridian.

Fig. 3 represents the star's image when the same trough lengthwise is *perpendicular* to the meridian.

Fig. 4 represents the star's image when the same trough lengthwise is inclined at *half right angles* with the meridian; in this instance the trough pointed south-east and north-west: had it been pointed lengthwise north-east and south-west, the line of stars would have been south-east and north-west.

Fig. 5 shows the star's image when the mercury was contained in a vessel 11 inches square, its sides being in and perpendicular to the meridian.

Figs. 6 and 7 show also images seen when the mercury is in the same square vessel similarly placed; and occasionally also corresponding images are presented by the mercury in the long rectangular trough when it is lengthwise *in* the meridian: the flitterings of the small stars render these images extremely troublesome to the observer.

Fig. 8 is afforded by the mercury being contained in an octagonal vessel; the eight stars exterior to the nebulosity are almost always blue, are of considerable magnitude, and their appearance, as well as their sudden disappearances and reappearances, are embarrassing.

Fig. 9 shows the star's image as reflected from the surface of mercury contained in a circular wooden vessel of 18 inches diameter, and under tremors more considerable than any which produced the preceding images.

GREENWICH PARK.

COPY of the REPORT of Sir JAMES SOUTH to the ADMIRALTY, with additional Memorandum, on the probable Danger of any Railway passing within a given Distance of the ROYAL OBSERVATORY, GREENWICH (in continuation of Parliamentary Paper, No. 375, of Session 1846.)

(*Sir Robert Harry Inglis.*)

Ordered, by The House of Commons, *to be Printed,*
6 *July* 1846.

470.

Under 2 *oz.*

idea of the stuff of which this volume is made. If the fashions are to their taste, we refer them to its pages for great varieties of the same.—An announcement in the poetical text, that the yachters, rambling about Boulogne, "laughed at" the Napoleon Pillar, is emphasized by the following note:—

"Napoleon's monument of the 'conquest' of England, which he never visited but as its *prisoner*. It remains the most solid burlesque in existence. Any nation but the French would have pulled it down long ago, from the mere sense of ridicule."

Now, there is a vulgar mistake about this Imperial column, altogether. It is neither an insult to the English nor a burlesque on the French,—and none but a nation of children or barbarians would have pulled it down. The pillar was never meant as a monument of the conquest of England. It was, even in its first intention, a mere military memorial,—subscribed by the officers of the grand army, to mark the fact of their long encampment in that neighbourhood, under the Emperor. That the *purpose* of that gathering was, or was avowed to be, an invasion of England, is beside the question.—Subsequent events prevented the full execution of the original design by those with whom it originated; and the monument was finally completed, as an historical document, by a government friendly to England, and a family whom she had sheltered—as the inscriptions record. The site is a noble one—the column is an ornament to the land, and a steering mark at sea:—and so far as it can have the interpretation which this writer and others assign to it, it stands a striking memorial to both nations of that baffled ambition, to whose discomforture the one and the other owe their present condition of prosperity and peace.

The Past and Future of the British Navy. By the Hon. E. Plunkett, Commander R.N. Longman & Co.

FRANCE, we are told, is ambitious of becoming a naval power; and England has reason to take precautions against any sudden enterprise which may peril, if not destroy, her maritime pre-eminence. The Hon. Mr. Plunkett believes that a crisis, if not imminent, is still dependent on so many contingencies that it may occur when least expected; and that we should, therefore, hold ourselves, if not in a warlike attitude, at least in such a state of preparation as would prevent our being taken unawares. He enters into a comparative estimate of the maritime forces of the two countries; and, while he exhibits England as superior in the physical elements of strength—such as ships, stores and supplies—he asserts that France has the advantage in the number of trained seamen whose services could be rendered immediately available. Believing that he has pointed out some serious faults in our system, but that, at the same time, he has fallen into some grievous errors, we offer a few words of comment on his statements—though the subject scarcely comes within our natural range of topics.

We find uniformly that naval superiority was the result of commercial superiority; and that no nation ever maintained a belligerent, which had not previously a mercantile, marine. Such was the case with Venice, Genoa, Spain, Portugal, and Holland. And, though our author follows Victor Hugo in quoting the Punic Wars as an evidence to the contrary, we believe that they afford an incidental confirmation of the rule. Those wars arose out of the policy of the Barcine family; all of whom supported a system of conquest and territorial aggrandizement, in opposition to the commercial system which prevailed before their advent to power. They sought to establish forts instead of factories, and demanded tribute instead of barter. In consequence, a growing share of the commerce of the Western Mediterranean was transferred from Carthage to the Greek cities of Sicily and Southern Italy; and from them the Roman gallies obtained their crews when the struggle for empire began. The Romans, always unjust in relating the history of enemies, were still more so in acknowledging the assistance derived from allies; but Polybius distinctly states that their crews were chiefly collected from the Italo-Græcian States. We have no materials for estimating the commercial marine of Carthage at the time of these wars:—but there are many indications of its decline from the time that the territorial policy of the Barcine faction had triumphed over the trading system of earlier times; and, though Rome had no trained sailors, her allies could supply them in greater abundance than her rival.

The commercial marine of England is, at least, three times greater than that of France; and Frenchmen, themselves, will confess that the English are their superiors in all matters of practical seamanship:—but in time of war something more than seamanship is required. The men must be trained to the management of artillery and small arms. According to Mr. Plunkett's account, France possesses a greater number of sailors thus trained and disciplined than England,—and, therefore, would be certain of gaining signal successes at the beginning of a war. In France, the whole mercantile navy is subject to the control of the Minister of Marine; and a system of compulsory service has been established, which, though not so obviously unjust as our impressment, is far more oppressive, because it is in constant operation. But this system, while it has made the French better gunners, has certainly not made them better sailors,—as any one who has watched the shipping of different nations in Havre, or any of the northern ports of France, is well aware.

It is, however, a matter open to discussion, whether it would not be possible to introduce some system of training in the exercise of guns and small arms amongst the sailors in our ports; or whether a reserve force of marine artillery should not be maintained in our arsenals, sufficient to supply at least one experienced man to every gun, in case of an emergency. This is a practical suggestion made by Mr. Plunkett; and its merits may be left to be estimated by practical men.

The most important matter, however, discussed in this volume is, how a fleet is to be manned in the event of a war. The barbarous system of impressment would not now be tolerated. It is easy for Mr. Plunkett to talk of a factious press and seditious pamphlets; but it is neither faction nor sedition to say, that the sailor, like every other subject of the Queen, has a right to dispose of his labour to the best purchaser. We doubt whether the system of impressment could have been maintained in its rigour during the whole of the late war;—we have no doubt that it would be impossible to revive it after thirty years of peace. We must make the service *desirable* for sailors,—by bounties, by increased pay, by superior treatment, and by hopes of promotion. But Mr. Plunkett says that this system of recruiting would be found inadequate, on a *sudden* emergency. He seems to believe that a war might be commenced "suddenly," without any previous warnings of diplomacy; and he avers that M. Thiers more than meditated such a *coup de théâtre* in 1840. He further expresses his fears that some "eccentricity" on the part of French naval officers in the Pacific might lead to an explosion, which France would meet with an immediate demonstration of a greater force than we could command. But we doubt whether "a war suddenly commenced" is within the range of possibility. It would excite the indignation of the whole civilized world against the aggressor; and whatever momentary success might be obtained would be more than compensated by the moral loss in influence and character. Some note of warning would, assuredly, announce the approach of hostilities;—Thiers himself would at least go through the formality of a declaration of war. The only danger which Mr. Plunkett seriously apprehends is a sudden outburst; and this we believe to be beyond any reasonable calculation.

Books for Children.—What would our trusty and well-beloved friend John Andersen of Denmark have said in the days when he was apprenticed to a tailor, [see *Athenæum*, No. 906] and sate stitching and sighing the while he dreamed of Elf-land, could he have foreseen that a time would come, when men should quarrel which should first get speech of him, as a Poet? Yet, so it is: the contrast between his past and his present position is not *orientalized* for the sake of effect. When we write of the struggles of men of genius, and invite the young to sympathize with the same, it is fit that we should dwell also upon their successes; and point out how these—in one compensating form or another—more constantly await honest and single-hearted energy directed towards good purposes, than the grumblers admit. We do not know how, more instructively, to begin a comment on books for the young than by calling the attention of all to so cheering an example.—Here are Andersen's *Danish Story Book*, and his *Nightingale and other Tales*, both *Translated by Mr. C. Boner—with Illustrations by the Count Pocci:* in which we have met, for the third time, a version of 'Little Ida's Flowers,' and the 'Wild Swans,' and 'Ole Lucköie'; and, for the third time, on peeping between the leaves, found some word or fragment of colour so fascinating as to detain us till the tale was told to the end. The more such beautiful and delicate poetry can be diffused among our children and grandchildren the better. When we think of the *calculation-morality* books which were in vogue twenty years ago, and turn to these, it seems as if the World were growing young again:—bathing itself anew in the bright waters of Poesy, and still without thereby losing its dearly-bought Experience! Count Pocci's illustrations are *earnest* rather than graceful. Some of the initial letters and vignettes, however, show the true German fantasy: which is, also, that of faëry-land.—With these, we must notice a new issue of treasures for the young by Mr. Cundall, of Bond-street, who bids fair to become more popular among our children, than Mr. Newbery, "Corner of St. Paul's Churchyard," was with our grandfathers and grandmothers. Bound in scarlet and blue and sea-green and gold, *Gammer Gurton's Story Books* offer such tempting versions of the good old "babe-reading," that the grown man's Library of Fiction need not be ashamed of opening its doors to them. The "Famous Histories" of Friar Bacon, and of Sir Guy of Warwick, the Ballad of Fair Rosamond—'The Doleful Story of the Babes in the Wood,' 'The Mad Freaks of Robin Goodfellow,' and eight other no less precious pamphlets, are before us—beautifully printed in the quaint old style,—the border of every page illuminated, and each with a brave coloured frontispiece. Some among the last-named attractions are worth the price of the book: let us instance the illustration to 'The Merry Tale of the King and the Cobbler,' and Mr. Absolon's clever design to 'The Beggar's Daughter of Bethnal Green.'

OUR LIBRARY TABLE.

A Letter to the Right Hon. W. E. Gladstone, M.P., on the Extension of Steam Navigation from Singapore to Port Jackson. By Lieut. Waghorn, R.N.—The importance of the subject of this pamphlet, and the name of the author, are sufficient claims on the attention of all who are interested in the extension of steam navigation to the purposes of speedy communication with our Australian colonies. The first sentence in the letter speaks more cogently than and recommendation of ours.—"At the date of this pam-

phlet (20th May, 1846), the latest arrival from Port Jackson is by the ship Hooghly, which sailed direct therefrom on the 1st of January, being 140 days; and how much longer we may be without advices from the Seat of Government there is a matter of conjecture. This fact alone, if there were not many others infinitely more striking, should amply show the necessity of putting an end to a system like the present,—productive of all sorts of anxiety and uncertainty to the thousands upon thousands interested in the receipt of intelligence,—and destructive of the promptitude and regularity on which, in these days, commercial prosperity so much depends."—It is high time that something should be done to remedy so grave an evil as this. If the object proposed by Lieut. Waghorn can be attained at the outlay which he mentions, there should be no delay in the matter. Of course, only the Government can be expected to provide the necessary funds—or, at least, the greater portion of them; and we hope to find the new Secretary for the Colonies more prompt on the subject than his predecessor.

Modern Geography Simplified, and Illustrated by Moral and Historical Observations, &c. By a Member of the Society of Friends.—In the first part of this work there is not much novelty; nor do we see that the arrangement is at all superior to that of other elementary books of the same class. But in the *second* (which is also the longer) there are many useful moral observations. These we approve when, as in the present case, they are for the most part dictated by candid and liberal feelings. It is of still greater importance, that the author is always honest in the expression of opinions and evidently actuated by the spirit of benevolence. We recommend the book, as less mechanical than its contemporaries, and because it assumes that children have *minds*,—something within them distinct from the *material*. The truth is, that nearly all our school books are more or less open to the charge of being designed for machines, rather than for thinking creatures.

History of the Origin and Progress of the Irish Society. By W. J. M. Mason, L.L.D., Secretary to the Society.—This pamphlet has been forwarded to us by the Secretary of the Irish Society, with a request that we would correct a statement which appeared in our columns [*ante*, p. 647] to the effect that the Irish Society had been abandoned. We find, on this testimony, that the Society still exists for the purpose of proselytism, though it has given up all its educational functions. It was as an educational agent only that we referred to it,—and we are glad to find that its history establishes the truth of the theory which we sought to impress upon our readers. Proselytism opens a quite different question—with which we have no inclination to meddle. The accounts given of the processes and progresses of conversion from Romanism in Achill, Kingscourt, and Dingle, are beyond the pale of criticism—for they are beyond the range of ordinary comprehension. There have been some dozen "new Reformations" in Ireland; each of which proposed to take Popery by storm, and establish Protestantism by a *coup de main*. Each of these failed in succession;—but each exasperated passions and stimulated animosities that survived the delusions which gave them birth. It has been well said—

> What more from her saints can Hibernia require?
> St. Bridget of old like a dutiful daughter
> Supplied her, they say, with perpetual fire,
> And now her saints keep her in endless hot water.

The Secretary to the Irish Society's kettle is already at boiling-heat; and we shall not supply any of the fuel of controversy.

The Golden Treasury of Life; or, Old Sayings and True Ones. By Edward Clare.—A short collection of proverbs, apothegms and maxims, extracted from various sources;—partly from the traditionary stock once so famous in English common life, and partly from well-known writers. It is, however, too brief for the subject; which might be—and, indeed, has been—rendered curious and striking. Mr. Clare is not very recondite in such matters: and we doubt whether they have nearly as much interest for *him* as the 'Catalogue of Musical Works' (by himself), which he has appended to them,—and which occupies just as many pages as the proverbs themselves. Such a mode of advertising is about as ingenious as that of a certain well-known annual almanack, in which the knowledge of times and seasons and astronomical observations is made subsidiary to that of the drugs and medicines incorporated therewith. But, ingenious as may be the idea, we must censure its execution. We are no friends to quackery in any shape,—and least of all in literature.

Studies of Public Men. No. I.—As the *Athenæum* has no vocation to politics, we are not called on to estimate the merits of this book—or rather of the particular subjects which it comprises. We may observe, however, that the author is no party man,—that he deals out a liberal share of justice to characters extremely dissimilar,—that he is by no means deficient in shrewdness,—and that he has studied to some effect the political and social tendencies of the age. But his sketches are much too brief, considering the importance of the subjects to which they relate;—whether that importance be *intrinsic* or not, is not the question. The characters selected for illustration have exercised, and promise to exercise, large influence on society; and the estimate formed of them should be commensurate with that influence.

Metaphysical Analysis.—The author of this little volume is a very self-complacent personage,—and believes that he has made some discovery predestined to immortality. In reality, however, he has only repeated Locke's theory, that all our ideas are derived from sensation and reflection. The question at issue between the followers of Locke and Victor Cousin is not so much about innate ideas as innate conditions, or laws, of ideas,—first started by Kant. Having missed the real point in dispute, the author arrives at a conclusion in which nothing is concluded.

On the Speculative Difficulties of Professing Christians.—The design of this work is good; but the execution is feeble—indeed, more calculated to raise doubts than to solve them.

Laneton Parsonage; a Tale for Children, on the Practical Use of Portions of the Church Catechism. By the Author of 'Amy Herbert,' &c. Edited by the Rev. W. Sewell, B.D.—*Abbotsmere; or, Illustrations of Home Education.* By Mary Gertrude, author of 'Philip Randolph.'—Good reason might be given, we think, why the teaching offered in these two books cannot be rated as of the highest order, had not the ground been already often travelled over by us. We cannot conceive that any child will be efficiently taught the beauty of truth by a display of trickery—even though the trickery come to punishment,—or the grace of simplicity by long and laboured analyses of the motives and foibles which lead to error. Both these stories are interesting for the speculation of grown people; but as books for the guidance of children they are "nought"—because proving too much.

Letters to a Clergyman on Institutions for Ameliorating the Condition of the People. By John Minter Morgan.—This is a small book,—but one relating to a very important subject. Its fundamental principle is, that labour in communities is more easy, certain, and profitable than by individuals. Thus, three hundred families associated into one village, labouring for the common good, participating in the common profits, and subject to definite regulations, would, he contends, be in every respect better provided for than under the system now prevailing. The principle has been often tried in the New World; and, though it has sometimes failed, it has frequently succeeded. Some of the most prosperous communities on the face of the earth are now to be found in the Transatlantic forests,—consisting, in many cases, of persons who had done little either for themselves or society while isolated and exercising individual callings. The circumstances of the old world, however, are less favourable to such experiments than those of a new country. Yet even amongst ourselves, the Moravians, as everybody knows, have adopted the principle with success,—as well as on the Continent. Generally speaking, the moral and religious training of Englishmen does not qualify them for a course of life wherein the individual will must, to so large an extent, be sacrificed to the general order; but there will be found in most communities some, who, for their own advantage, would heartily co-operate in any reasonable system of domestic economy. One thing is clear—the present state of society is not what it should be; and any change recommended by sound argument, practical fesibility, and reasonable prospect of advantage, is deserving of serious consideration. The plan of Mr. Morgan has, it seems, been examined and approved; and there is reason to believe that a model village, on his principle, will ere long be created to test it. The French Government is not insensible to the importance of this subject; having two establishments of the kind—not, indeed, for families, but for the young; and which, so far as they have been proved by time, have answered well, and are likely to answer better. We allude to Mettray and Le Petit Bourg; which Mr. Morgan visited, and which he describes in the 'Letters' before us. In another point of view, the project is deserving of a trial:—the individual or selfish principle has existed long enough,—and, in regard to the community at large, has failed. It might be well to see whether a desire for the general good may not also be made to have some influence on human conduct,—we mean, of course, when associated with the advantage of the individuals. Selfishness has hitherto been the root of all our social evils; and any scheme which proposes its diminution is one, at least, of wholesome intention.

LIST OF NEW BOOKS.

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GREENWICH OBSERVATORY.

I request you to insert in your scientific journal the following letter, addressed to Sir Robert Inglis. The subject to which it immediately relates is important; but infinitely more important is the principle of protection against attacks made under assumed Parliamentary authority, which is involved in the protest against the transaction to which this letter relates.

G. B. Airy.

To Sir Robert Harry Inglis, Bart., M.P.

Royal Observatory, Greenwich, July 21, 1846.

Sir,—In your place in the House of Commons, you did, on the 23rd of June, move and obtain an Order of the House for a "Copy or Extract of Report of Sir James South to the Admiralty, dated on or about the 22nd inst. on the probable danger of any Railway passing within a given Distance of the Royal Observatory, Greenwich;" and the paper thus produced at your instance was ordered by the House of Commons to be printed, on the 6th of July,—and is now to be purchased of all booksellers. This paper contains various insinuations against the conduct of the Royal Observatory;—that is, against myself, the director of the Royal Observatory, who am responsible in the first degree for every transaction within that establishment. You, who were, or ought to have been, acquainted with the contents of this paper before you sanctioned its publication, did not take any measures for the reference of these insinuations to the investigation of official or scientific persons: you gave them, with the borrowed authority of the House of Commons, to the public. The person who wrote these insinuations on the 22nd of June, in order that they might be called for by you in the House of Commons on the 23rd, took no steps to use the official authority which he personally enjoys for the regulation of the Royal Observatory, to investigate or correct these faults in the conduct of the Royal Observatory. He gave his accusations, under your sanction, to the public:—to the public then shall my answer go.

I shall say little on account of the effects of gentle

tappings, which occupy the greater part of Sir James South's second page,—or upon the form of the rows of beads which nearly fill the third page,—except that the phenomena of both these classes, thus produced for the edification of the House of Commons and the public, are perfectly familiar to the youngest assistant in the Royal Observatory. The diagrams Nos. 1, 2, 3, 4, are quite correct. But I must remark on one of Sir James's insinuations. "At Greenwich, the trough is placed lengthwise on the shelf, so as not to be offensively to the eye out of the meridian." Quite true.—"That the trough be placed in the plane of the meridian is in the highest degree important." Excuse me, Sir James, it is not in the smallest degree important. The central image can always be distinguished from the rest; and I really am inclined to believe that the judgment is assisted, in the bisection of that central point, by a trifling inclination to the wire of the line of bright points in which the place of that central point is known. Sir James has omitted the conclusion to which he is endeavouring to lead his readers,—"that the observations by reflexion at the Royal Observatory are faulty;" and I shall, therefore, after having rebutted his second dogma, substitute *my* conclusion,—"that the observations by reflexion at the Royal Observatory are as good as it is possible to make." As to the use of round troughs, &c.,—of which Sir James, after twenty years' practice without them, has discovered the utility just in time for this paper of the 22nd of June,—the general inconvenience of their shape, and the difficulty of protecting them from the wind when used for low objects, will effectually prevent them from being used in any *practical* observatory.

Now, Sir, these matters of long and round troughs, and the inclination of the long troughs to the meridian, and the contrast with Sir James South's practice, are in themselves totally unimportant. But they are not unimportant as appearing in a Return to an Order of the House of Commons, "On the probable danger of any railway passing within a given distance of the Royal Observatory." They may serve to you, and to other members of Parliament, for an instance of the danger of calling for and publishing the papers of private writers without due examination of their contents. The insinuation about the effects of the trough "placed so as not to be offensively to the eye out of the meridian," has nothing whatever to do with the effects of a "railway passing within a given distance of the Royal Observatory;"—but the opportunity of bringing in this insinuation was too tempting to be lost. But I shall shortly produce a far grosser instance.

As to the observation of transits by reflexion, invented by Sir James South on the 4th of June, 1846, possibly you and the House of Commons may be surprised to learn that such observations were tried at Greenwich and at Cambridge at least as early as 1827,—and were rejected. The stages intended for these observations are still in existence at the transit-rooms of both Observatories. I will not weary you with the mechanical reasons which prove that, if the weight of a transit instrument produces error in one direction on a transit observed directly, it may produce error in the same direction on a transit observed by reflexion;—I will merely assure you that any person accustomed to consider the mechanical action of the weight of the different parts will perceive at once that it is so; and, therefore, that there is no certain tendency to correct the effects of flexure of a transit by the combination of direct and reflexion observations. If direct and reflexion observations are made in both positions of the transit-axis, there is a tendency to correction. But the fact is, that the transit is by far the firmest instrument in modern astronomy,—and the whole scheme is perfectly idle. And thus terminates the proposition for reflexion observations with the transit instrument.

I now come to a more serious matter. I take the following passage *verbatim* from Sir James South's paper; and I beg you to remark that the word "enormous" is there printed in italics:—

"If this principle be acted upon, as I hope it will, the *enormous* discordance between the differences of right ascension of Sirius and Fomalhaut, as determined by the late illustrious Bessel on the one hand, and on the other by the assistants at the Royal Observatory at Greenwich, will be explained, and perhaps corrected."

The enormous ignorance of modern astronomical history displayed in this paragraph by a *soi-disant* astronomer almost exceeds belief.

The insinuation here conveyed is, that there is a great difference between the astronomical results of Bessel's observations and those of the Greenwich observations. Could you conceive that the difference really is between the places of the stars as now seen in the heavens and their places as predicted in Bessel's 'Tabulæ Regiomontanæ,' published in 1830;—that this difference was discovered, or, at least, first pointedly remarked, by Bessel himself;—that when Bessel was closing his paper upon the subject, he received the Greenwich observations, and appealed to them as triumphantly supporting his own observations;—and that upon this very discordance with the predicted place, thus supported by the Königsberg and Greenwich observations, Bessel founded the boldest of all his speculations,—namely, that some of the stars are accompanied by invisible companions? Yet so it is, in every point; and every point that relates to Greenwich shall be proved to you.

The discordance of right ascension of which Bessel has pointedly treated is that of Sirius. His memoir is contained in Nos. 514, 515, 516 of the *Astronomische Nachrichten*. In No. 516 he comes to the following conclusion (I omit the comparisons before 1825):—

"The differences of these catalogues from the 'Tabulæ Regiomontanæ' are—

	s.
Bessel, 1825	0·000
Struve, 1825	−0·006
Argelander, 1828	−0·003
Airy, 1830	+0·049
Pond, 1832	+0·084
Busch, 1835	+0·188
Bessel, 1843	+0·331"

Bessel then goes on with some general remarks; and concludes his paper as follows:—

"*Postscript.*

"While the foregoing essay was passing through the press, I was delighted with the receipt of the latest of the volumes which, every year with increasing importance for astronomy, issue from the Royal Observatory of Greenwich. This volume (1842) contains a catalogue of 1439 stars for 1840; by the formation of which, from numerous and accurate observations from 1836 to 1841 inclusively, Mr. Airy has made a very valuable present to science. Besides this catalogue, the volume contains another, founded on the observations of 1842 *alone*. Both catalogues are very welcome for the present inquiry; since the lateness of the times to which they correspond enables them *independently* to confirm the rapid increase of the error (produced by the assumption of invariability in the proper motions of stars), which was discovered *solely* from the latest observations made here" (that is, at Königsberg). "Their results" (that is, the results of the two Greenwich catalogues) "are—

Relative Declination of Procyon,

	m.
1838	+1·76
1842	+2·78

Relative Right Ascension of Sirius, in time,

	s.
1833	+0·218
1842	+0·264

"All these results serve perfectly as a continuation of those collected above. The number of observations, however, in 1842 is hardly sufficient to answer for a few tenths of second in declination, or for a few hundredths of second of time in right ascension."

The right ascension of Fomalhaut is nowhere treated of by Bessel, as deduced from his own observations; though its discordance with the 'Tabulæ Regiomontanæ' in a direction opposite to that of Sirius is pointed out by him as proved by the observations of several astronomers.

And this, Sir, is "the *enormous* discordance between the differences, as determined by Bessel on the one hand, and on the other by the assistants at the Royal Observatory at Greenwich." Shame on the ignorant calumniator who wantonly throws about these insinuations;—inserting them in papers that purport to treat of matters with which they have no connexion, and that present no peculiar fitness for their publication, except the assumed sanction of the legislative assembly which carries them into the world! And how much of the shame, Sir, ought to attach to the senator who lends to these malevolent essays the power which he has himself borrowed from the House of Commons?

The order of Sir James South's remarks permits me now to advert to the accuracy of the determination of the zenith points of circles.

Sir James has discovered that "22 pairs of observations (direct and by reflexion) are not enough." Let me request you to whisper in Sir James's ear, that 2,200 pairs are not enough for theoretical accuracy. As long as individual observations are liable to error, so long will all combinations of observations, in whatever number, be liable to error. The question is a question of degree only. I will endeavour to give some results that will enable you to judge of this degree.

I will suppose (what I believe to be perfectly true) that observations by reflexion are as good as observations by direct vision. And, to fix our ideas, I will suppose that the probable error of any observation is 1″.

Then, if the observation of a star be combined with a zenith point determined by *one* star, the probable error of the result is 1″·23. If the zenith point is determined by two stars, the probable error of the result for a star is 1″·12. If three stars are used, it is 1″·08. If six, as allowed by me, it is 1″·04. If twenty-two, as rejected by Sir J. South, it is 1″·01. If 2,200, it is 1″·0001.

Now, if Sir James South really does continue to think that it is worth while to increase the number of reflexion-observations from 6 to 22, in order to diminish the probable error of a result from 1″·04 to 1″·01, I know no means of inducing him to change his opinion. It is proper to remark, that the small part depending on the reflexion-observations is not of the nature of a constant error;—the zenith point being determined independently every night or every two nights.

It is also proper to remark, that a smaller number of reflexion-observations is required now than was necessary when two circles were used. A trifling computation shows, that the probable error of zenith point depending on six pairs with one circle is no more than that depending on twelve pairs with two circles combined with twelve other pairs of comparison-observations.

But, perhaps, Sir, you may desire to know what is the opinion of competent judges upon the results which the Observatory, under the system despised by Sir James South, really does produce. I have given Bessel's opinion on the declinations of Procyon; the only opinion besides this which has met my eye is one by Encke, in the *Astronomische Nachrichten*, No. 550. The subject of the paper is a very important one—the latitude of the new Observatory of Berlin. This was determined (among other ways) by the use of the transit instrument in the prime vertical; a method which requires the catalogued places of stars, but which is considered by the German astronomers as giving a more accurate determination of the difference of declination than any other method. The observations were made on the two stars, θ Ursæ Majoris and β Draconis: the absolute declinations were taken from Encke's Catalogue, from Argelander's, and from the Greenwich Catalogue of 1,439 stars. The remark of Encke is—"The agreement of the Greenwich differences of declination with those here observed is far more satisfactory than with the two other determinations; for the discordance with the Greenwich differences is only 0″·4, while the discordance with both the other determinations [Encke's and Argelander's] amounts to 1″."—I think, Sir, that the Greenwich Observatory may yet hold up her head, without adopting Sir James South's suggestions.

And now, Sir, permit me to ask you if it is not a disgraceful thing that the director of a government institution should be compelled to resort to this step, to defend himself?—and if this shameful necessity has not been induced entirely by your sanction to the utterance of calumnious insinuations, under parliamentary authority? If Sir James South had made his remarks in his official place at the Board of Visitors of the Royal Observatory, he would have received such instruction and explanation as would have prevented further mischief. If he had brought them before any scientific society, they would probably have been laughed out,—and there their evil

would have terminated. But he prefers to bring them under your protection, which was meant for a different purpose;—and you give this protection without examining what it is which you thus protect. In your honour in private transactions I have the most perfect confidence. I am certain that, if your sanction were requested for the circulation of a paper apparently affecting private interests, you would give it cautiously. Ought not the same caution to be used when you give that sanction in the solemn character of senator? And ought not that caution to be even increased when the public station of the person attacked gives ruinous force to these public attacks; at the same time, that it legally or morally denies him the recourse to action for libel which a private person might urge? As regards the injury which it could do to me, I could very well pass over this particular attack; but it is not the first which has been produced in the same manner: and I am unwilling any longer to restrain my protest against the principle involved in it.—With very great private respect, I remain, Sir, your obedient and faithful servant,

G. B. Airy.

AUSTRALIAN DISCOVERY.

Bath, July 20.

The review, in the *Athenæum* of June 27, of Capt. Stokes's Discoveries in Australia, and the editorial note on Capt. Sturt's Australian Expedition, point out with precision the true direction in which alone exploration can be prosecuted, with hope of success in resolving the obscure points relating to the geography of the interior of New Holland.

It is to be hoped that those suggestions will not be permitted to fall to the ground. How could the Council of the Geographical Society be better employed than in promoting, with or without the assistance of Government, an expedition, which, ascending the Albert River to the highest navigable point, and there making a temporary station, should detach a smaller party to the S. or S.E. as might be found practicable, with a view to explore the nature of the comparatively small tract of country intervening between the extreme points reached by Captains Stokes and Sturt respectively.

I would propose that the scientific conductors of such an expedition, being appointed in this country, should proceed by Egypt to an Indian port, with the means and authority for there chartering a vessel of moderate tonnage and small draught of water, for the ascent of the Albert.

I beg to differ on one point from the suggestions contained in the review,—viz., as regards the employment of camels. However suitable they might be for an expedition from the south, they appear to me unnecessary and unadvisable in any attempt from the north,—which is, in all respects, the most promising point.

There, Captain Stokes found both grass and water, with a level country: so that it would appear that the face of the land is such as would neither require nor justify the use of those animals; and they *might* prove a source of trouble and embarrassment instead of advantage.

In the manner which I have suggested, I believe that much might be done in a comparatively short time and at moderate expense: while, in case of success, complete or partial, similar experiments might be repeated from the western and eastern sides of the continent;—assuming, what I believe to be the case, that all attempts from the S. and S.E. are likely to be fruitless.

However such points may be decided, there can be no hesitation in asserting that it is not creditable to the character of the nation, either in point of science or policy, to leave important geographical problems unsolved, without making any attempt to overcome difficulties less than those which our polar navigators have set at defiance.

H. J. Wilmott, R.N.

Since the above letter reached us, the Indian Mail has brought to the Royal Geographical Society, from Singapore, intelligence of great interest respecting the fate of Dr. Leichardt and his party—for whom the most serious apprehensions had been entertained. It is gratifying to announce that the enterprising travellers have, with one sad exception, arrived safely at Port Essington,—after sixteen months journeying in the desert, amid privations and difficulties of the most trying kind.—Our readers will remember that Dr. Leichardt, accompanied by Mr. Gilbert, a naturalist, and six others, started from Moreton Bay, in October, 1844, to penetrate to Port Essington; in order, if possible, to open a direct route to Sydney, right across the country. In the spring of 1845, various reports arrived at Moreton Bay of the party having been cut off by the natives. To ascertain the truth, an expedition was sent out in August last, under the command of Mr. Pemberton Hodgson; which traced the party for a distance of four hundred miles, far beyond the place of their supposed massacre—but was ultimately compelled to return, with a hope only of the probable safety of the adventurous explorers, who have at length brought their journey to a successful termination. Dr. Leichardt found it impossible to penetrate into the interior in a direct course, on account of high tableland and the absence of water; and this circumstance compelled him to keep within six or seven degrees of the coast. Their six months' provisions being exhausted, the only resource of the party was the horses and stock bullocks,—and with these the strictest economy was necessary. One was killed as provision for a month—sometimes a horse, at others a bullock. For six months prior to reaching Port Essington, the party were reduced to ½lb. of meat per day—frequently putrescent,—unaccompanied with salt, bread, or any kind of vegetable. In the neighbourhood of the Gulf of Carpentaria, Mr. Gilbert, the naturalist, and Mr. Calvert, having been separated from the main body, went to sleep on the ground without keeping watch. They were surprised by the natives; and Mr. Gilbert was first speared, and then his brains were dashed out with a club. Mr. Calvert, although speared through both legs, managed to rejoin his party. The travellers at length reached Port Essington, on the 2nd of December, 1845; and, after a six weeks' sojurn to recruit, they sailed for Sydney, in the Heroine.

ARCHÆOLOGICAL INSTITUTE OF GREAT BRITAIN AND IRELAND.

[*From our own Correspondent.*]

York, Thursday, 23rd of July.

The annual meeting of the Archæological Institute commenced on Tuesday last, in this city. The Society was established in the year 1843: held its first general meeting at Canterbury—its second at Winchester—and comes now, appropriately, for its third, to the Eboracum of the Romans and great cathedral city of the north. A society like this can scarcely err in the selection of a particular locality for the scene of its anniversary meeting. England abounds in objects of antiquarian interest; and York and its neighbourhood have much to invite and detain the student who loves to illustrate and revive the past. The antiquary who confines his labours to Roman remains in Britain, finds in York and its vicinity (at Aldborough especially) ample range for his especial research, without creating imaginary roads, or indulging his fancy in visionary cities and questionable encampments. The historian sees before him a city rich in its associations,—with walls and towers and gates made memorable on many historical occasions. The architect has a rich field for investigation in the proportions and details of its noble Minster,—a study in itself; without the additional attractions of Beverley and Fountains, Rievaulx and Byland, and the lesser localities in the immediate environs of the town. The selection was, therefore, in all respects, a wise one,—nobly responded to, we are glad to find, by the authorities of the place. Meetings of this kind deserve to succeed. They extend information;—their members teach and are taught. The local antiquary finds friends from distant places to sympathize with him in his pursuits. Ideas are exchanged, information is obtained, and industry is awakened. The labourer learns, from such, to preserve the vessel or the coin, which chance has turned up with the earth upon his spade; and churchwardens at least to hesitate before they begin to "beautify and repair." Much is doing, and much remains to be done: but the discussion of the last is hardly our province at present. The Institute is, as yet, only feeling its way,—has honorary secretaries, and honorary committees,—and funds hardly sufficient, so far, for all the purposes for which it was established.

The General Meeting was held in the Festival Concert Room, on Tuesday at one o'clock. Among the members present, we observed the Marquis of Northampton, Earl Fitzwilliam, Viscount Downe, the Dean of York, the Dean of Westminster, the Dean of Ely, the Dean of Hereford, Archdeacon Wilberforce, Archdeacon Churton, Dr. Plumptre, the Rev. William Vernon Harcourt, Sir Richard Westmacott, Sir John Boileau, Sir William Lawson, M.P., the Lord Mayor of York, the Recorder of York, Sir Joseph Guest, Sir Roderic Impey Murchison, Prof. Phillips, Prof. Willis, Rev. Joseph Hunter, Rev. J. L. Petit, Rev. Charles H. Hartshorne, Mr. Hawkins, of the British Museum, Mr. Shaw (so well known by his illuminated books), Mr. J. G. Nichols, &c.

The Marquis of Northampton, the President of the Institute for the past year, observed, that the very pleasing duty had devolved upon him of placing Earl Fitzwilliam in the chair on this occasion. We had come, he was glad to think, to a county rich beyond example in noble memorials of the past—entire and in ruins. His noble friend had always felt an interest in Archæology; and was proud, he was glad to think, to preside on this occasion. Had societies of this kind existed before, St. Mary's might have rivalled Rievaulx and Fountains. There was much for them to see. Since he had come here, he had seen a ruin which he had never seen before—and a very remarkable one it was. He alluded to that part of St. Leonard's Hospital recently laid open. It was formerly a wine cellar,—seldom seen by any other person than the owner of the wine, and of greater celebrity for the splendour of its cobwebs than of its architecture. He was glad to think that it was not again to be enclosed, but to form a part of the grounds belonging to the Yorkshire Philosophical Society. Before sitting down, he must express his regret at the absence of their friend Mr. Way,—and at the loss which the Institute had recently sustained in the death of Mr. Gally Knight. He was glad, however, to see the Lord Mayor of York present on this occasion—the only Lord Mayor of a city in England, he must observe; for it was not very generally known that the Lord Mayor of London, as he is called by courtesy, was only, in fact, Lord Mayor of Finsbury. He was glad, he would repeat, to see the Lord Mayor of York present on this occasion, and to observe the interest taken by him in the advancement of Archæology. The Lord Mayor of London had recently shown a particular regard for Science and Literature, and he was pleased to find the Lord Mayor of York doing as much for Archæology. They deserved to be patterns in this respect, not only to Lord Mayors, but to mayors, also.

The Marquis of Northampton then resigned the chair to Earl Fitzwilliam:—who addressed the Meeting at some length, and with great good sense and good feeling. He observed how much pleasure he felt at seeing the members of the Institute present on this occasion, and what gratification it gave him to be enabled to preside over a meeting of this description—composed of members who divided their time, for a week at least, so agreeably between recreation and instruction. The study of Archæology was now looked upon as something more than mere grubbing in the dark—the industry and learning of the present generation had formed it into a kind of science. The illustration of the past was indeed a delightful and a necessary pursuit. Monuments themselves require memorials at the last; and he knew of no body better calculated to preserve and illustrate the noble memorials of our country than the Institute he had now the honour to address. He could enlarge on such a subject—but they had much to do and much to see; and he knew that their time was valuable.

The Dean of Hereford (Dr. Merryweather) moved a vote of thanks to the Marquis of Northampton for his conduct in the chair during the past year. The Hon. Mr. Stapleton seconded it,—and the proposition was carried with great acclamation.

The Marquis of Northampton returned thanks; and expressed the great gratification which he had felt in the office of President. He had

kind sympathize with, whilst they tremble at, his crimes. The hero of this tale has nothing to redeem him from contempt; and, throughout the whole story, one can only wonder how its characters can be duped by such a shallow impostor. He commences his career as a German student,—comes over to England, to practise on the credulity of the public here,—and retires, with great wealth, to an estate in Germany. Thither, he is followed by an Englishman whose daughter had died under his care—and from whose consequent persecution he is continually obliged to save himself by flight. During one of these escapes, he falls into a covered pit—breaks his leg—and receives a fatal shock, which lays him on his death-bed; whence these 'Confessions' are dictated. The work is evidently a first essay;—in many parts dull and uninteresting, whilst in others there is a spasmodic effort at effect. It does not want for vigorous passages and good feeling;—and, probably, the author would be more successful in a second attempt.

The Life of a Beauty. By the Author of 'The Jilt.' 3 vols.—A capital subject is here spoilt. This 'Life of a Beauty' is a mere common novel, with a common heroine—who runs away with a deformed rich man for the sake of an establishment,—and whose daughter perpetuates her own triumphs;—the heart-perplexities of the latter, and their final brilliant settlement, forming the materials of the last third of the tale. The writer's tendency to coarseness and exaggeration is unpleasantly at variance with a subject which ought to have been treated with delicacy and grace. *The* Beauty had, so lately as half a century ago, a separate existence—an exclusiveness of empire, which the common sense (comprehending the sanatory discoveries) of our days has taken from her. Whole villages, we apprehend, would scarcely, now, sit up all night to see a Gunning get into her post-chaise in the morning—nor *rouleaus* roll in to the Melnottes who should exhibit slippers built for the fairy feet of the fairest ones of Queen Victoria's court. With other of the social despotisms, which gave to the world of good company distinctive features stronger than any which it possesses now-a-days, the reign of The Beauty has passed away. We have still lions—a De Staël, an Edgeworth, a Lady Sale, or a Countess Hahn-Hahn,—but the days of absolute sovereignty in matters of mere taste or opinion can scarcely come again. It is with such elements, however, that 'The Life of a Beauty' might have dealt,—and thus become a work of as much psychological interest as wit and refinement. And, seeing that the authoresses of England are no longer the slatternly race whom "no lord will woo, nor limner beg to paint,"—that a round half-dozen among them could be named who are entirely qualified to enter the lists for the Golden Apple,—we were in hope that the artistic skill of some one among these had been here at work, arranging those materials which belong to experience more than to imagination. Our disappointment has been the greater to find this novel what it is.

British Wild Flowers. By Mrs. Loudon.—This work has been issued in parts,—and is now complete. It consists of drawings and descriptions of the most common and beautiful of our British wild plants. We can cordially recommend the beautiful book to those who are commencing the study of botany. However necessary are such works as those of Lindley, Hooker and Babington, for the science of botany, they cannot be conveniently used by the young botanist,—who requires more assistance than words can possibly afford him in the identification of plants. The expense of completely illustrated Floras of Great Britain is so great, that only few, comparatively, are able to purchase them. Mrs. Loudon's present work embraces only the flowering plants; and the large proportion of our English books on this subject are devoted to these classes of plants,—but we think there is not less interest attached to the study of the cryptogamic tribes. A work on these—giving illustrations of some of the most common and interesting forms of our sea-weeds, lichens, ferns, mosses, and furze—would, we should think, meet with a remunerative sale, and tend to give a taste for the study of the vegetable kingdom as a whole. This we think important. Zoology and Botany are frequently studied in a fragmentary manner; and certain tribes or classes of animals and plants, to the exclusion of all others. This may be very profitable for science on the principle of a division of labour,—but there can be no doubt that it is injurious to the mind, and subtracts from that sense of beauty in the completeness and adaptation of all the parts of either kingdom of nature which would result from the study of the whole.

The Confiscation of Ulster. By T. MacNevin.—This little work bears evidence of deep research, a careful comparison of authorities, and an earnest desire to arrive at truth. The author admits—what has been denied by most Irish writers—that there were some plausible grounds for the attainders and forfeitures which placed the greater part of Ulster at the disposal of James I.; and he rightly attributes the plots of the northern lords to the general disappointment of the expectations which the Irish Catholics had formed at that monarch's accession. Throughout Europe, indeed, there was a general expectation that the son of a Catholic martyr—as Mary, Queen of Scots, was held to be—would show favour to the faith for which his mother had suffered. The failure of these hopes provoked vain resentments and abortive conspiracies,—craftily exaggerated by those who had an interest in extending confiscation. The great injustice committed was in the extension of the principle of forfeiture to the actual cultivators of the soil,—who could not be responsible for the crimes of their chiefs. Yet even this may find some excuse in the uncertainty of tenure under the old Irish law,—which gave the right of property, not to individuals, but to the sept or clan. The results of the system of plantation adopted were exhibited in the insurrection of 1641; the history of which is promised in a future volume of the 'Library of Ireland,'—and, until this shall be before us, it would be premature to enter into the discussion. We cannot, however, lay this little volume aside, without testifying that the calm dignity and sober spirit of investigation displayed by Mr. MacNevin offer a pleasing contrast to the wild rhapsodies which some other writers, in this monthly series, have attempted to palm upon the world for history.

First Lessons in French Grammar; with Exercises, adapted to very Young Children. By Mrs. John Atkyns.—Very simple, very plain, very easy to be understood;—and so far, therefore, well adapted to the purpose for which it is intended.

The Labouring Classes in Ireland. By Martin Doyle.—The rev. gentleman who publishes under the assumed name of Martin Doyle has rendered such service to the rural economy of Ireland, that all which he writes on the subject is entitled to respectful attention. In the little essay before us there are many valuable hints; mixed, however, with rather questionable suggestions—particularly as regards the extension of the allotment system. On one point, of great importance at the present moment, he has touched more lightly than we could have desired—the economical value of the potato as an article of food. It is suspected by many eminent agriculturists that potatoes are not only a precarious, but an expensive, crop. It is believed that, with equal cost and care, it would be possible to raise more nutritious vegetables, and to provide support for a sheep or a pig. This is done by the peasants of Normandy and Picardy, under circumstances frequently less favourable than those of an Irish peasant; and we can testify that some Irish labourers who have settled in the neighbourhood of Boulogne, have adopted the domestic economy (as to food) of their French neighbours,—and declare it to be both better and cheaper than that to which they were accustomed at home.

LIST OF NEW BOOKS.

Æschylus's Tragedies, English Prose from Text of Blomfield, 7s. 6d.
Baynes's Knitted Lace Collar Receipt Book, square, 6d. swd.
Bentley's Modern Literature, Vol. I. 8vo. 8s. 6d. cl.
Barnes's Notes on New Testament, 'Thessalonians,' &c. 12mo. 3s. cl. (Blackie); ditto, 'Ephesians,' &c. 12mo. 2s. swd. (Routledge.)
Barnes's Questions on the Acts, 12mo. 9d. swd.
Bogue's European Library, Vol. X. Gait's (J.) 'Life of Cardinal Wolsey,' 12mo. 3s. 6d. cl.
Bohn's Standard Lib. Vol. X. Schiller's 'Thirty Years' War,' 3s. 6d.
Brown's (T.) Lectures on Ethics, Preface by Dr. Chalmers, 8s. 6d.
Cocks's (C.) Bordeaux: its Wines and the Claret Country, 8s. 6d. cl.
D'Aubigné's (J. H. Merle) Discourses and Essays, with an Introduction, by Dr. Baird, 12mo. 1s. 6d. swd.
Eton Ovid. Metam., new edit. 12mo. 4s. cl.
Father Darcy, by the Author of 'Mount Sorel,' &c. Vol. II. 7s. cl.
Gleanings from Pious Authors, 12mo. 3s. cl.
Handel's Messiah in Vocal Score, with Accompaniment for Organ, arranged by Novello, No. I. 6d. swd.
Hochelaga; or, England in the New World, edited by E. Warburton, 2 vols. post 8vo. 24s. cl.
Harris's (Thomas) Memoirs of Rev. W. Bramwell, 12mo. 3s. cl.
Jackson's Companion to Work Table, 18mo. 6d. swd.
Long's (Lady C.) Midsummer Souvenir: Thoughts Original and Selected, 32mo. 3s. 6d. silk.
Mohan Lál's Life of Dost Mohammed Khan, illus. by 19 Portraits, 2 vols. 8vo. 30s. cl.
Noble's (Rev. S.) Doctrines of the Christian Religion, 8vo. 8s. cl.
Noble's (Daniel) The Brain and its Physiology, post 8vo. 6s. cl.
Osburn's Hidden Works of Darkness; or the Doings of the Jesuits, 18mo. 1s. 6d. cl.
Outram's (Lieut.-Col.) Conquest of Scinde, Part II. 8vo. 3s. cl.
Parlour Novelist, Vol. VII. 'Tales of the O'Hara Family,' Part II. 12mo. 2s. swd.
Plain Advice to Landlords and Tenants, 15th edit. 1s. swd.
Ryles's (Rev. J. C.) Train up a Child in the Way he should go, 6d.
Ryles's (Rev. J. C.) Seeking the Lord Early, 32mo. 3d. swd.
Rivers's (T.) Rose Amateurs' Guide, 4th edit. fc. 8vo. 6s. cl.
Roland's (G.) Introductory Course of Fencing, royal 8vo. 3s. 6d. cl.
Sailor's Hope (The) for Himself and the Nation, by a Naval Officer, fc. 8s. cl.
Scriptural Guide to the Duties of Every Day Life, compiled by a Lady, 1 vol. 8vo. 6s. cl.
Stelli's Pictorial Geography, Europe, square, 6d. swd.
Strickland's (Agnes) Lives of the Queens of England, Vol. IX. post 8vo. 10s. 6d. cl.
Sybil Lennard, by author of 'Gambler's Wife,' 2nd ed. 3 vols. 31s. 6d.
Transactions of the British Archæological Association, at its Second Annual Congress, held at Winchester, August, 1845, 8vo. 30s. cl.
Tudor Sisters (The), a Story of National Sacrilege, 3 vols. 31s. 6d. bds.

SONNET. THE LOVE-POET.

BY C. J. C.

In every country and in every age
Love hath a royal minstrel of his own;
Though never more a Judah's seer and sage
Shall sing his song divine like Solomon.
For, since earth soiled his heavenly lineage,
Love's bard is but a monarch's minion:
At Rome Tibullus was his gentle page,—
From Greece his cupbearer, Anacreon,—
In sunny Persia Hafiz fed his flowers,—
His chaplain was Valclusa's bachelor,—
While Spanish Boscan was his shepherd-swain.
A laureate yet was lacking to his bowers,—
Till than them all arose a sweeter strain,
When Erin's harp first felt the hand of Moore.

THE NAIL IN THE COFFIN.

What, threescore years and ten!—laughed a child, with eager look—
Oh, good my mother, there'll be time—nay, close that weary book!
Hark! very sweet the ousel sings upon the old elm bough,
And my trusty hound he waiteth me—I hear him whine e'en now;
For I've promised he shall scour to-day the beech-wood by the burn,
And rouse the coney from the brake and the hare from out the fern:
Oh! good my mother, chide me not—sweet mother, smile instead;
I'll read anon, when skies grow dark, and the merry months have fled.
Tap! tap! said the hammer
To the nail in the coffin-lid!

Oh, life is very long!—said the maid, between her smiles;
What reck I for the solemn priest, who all earth's joy reviles?
The time, indeed, may come for this glad heart of mine to wear
The sadder coloured vesture meet for trial and for care:—
But I have lovers twain, to-day—as all the world doth know,
And the sky is very blue above and bright the earth below;
And round about my pathway all sweet sounds and scents are shed—
I'll give good heed, O solemn priest! when youth—and these—have fled.
Tap! tap! said the hammer
To the nail in the coffin-lid!

Drink, drink, thou solemn, sad-faced loon! why list what dullards say?—
Quoth a yeoman old, with rosy cheek, of stalwart heart and gay;
There's no such virtue in their prayers and preachings, well I trow,
As sparkles up from this merry bowl, that saith—"Come, quaff me now."
Life's sand runs fast, too well I wot—I'm old, I know, and grey,—
But, troth! it seems to me, sir knave, I grow more hale each day:
Knock at my door, thou sad-faced loon, when ten good years have fled,—
And—ha! ha!—we'll drain as jolly a bowl, and never a drop be shed!
Tap! tap! said the hammer
To the nail in the coffin-lid!

T. WESTWOOD.

GREENWICH OBSERVATORY.

We have received the following letter from Sir James South, on the subject of the Astronomer-Royal's recent letter to the Speaker [illegible] We print it with pleasure, but we regret to find that the publication of a paper of which we [illegible] will [illegible] to the necessity of [illegible] to [illegible] for an answer to a charge which has been brought therein.

Observatory, Kensington, July 29.

I have no intention of discussing whether the letter of the Astronomer-Royal, published in the *Athenæum* of the 25th July, be a breach of the privileges of the House of Commons,—nor whether it was intended to intimidate members of the House from moving for information respecting a great national establishment. No word or expression of mine, in the paper which the Astronomer-Royal has thought fit to criticize, is disrespectful to himself or to the Observatory over which he presides. His remarks entirely rest upon forced interpretations,—or on inferences drawn by himself (how fair I shall hereafter show). The Astronomer-Royal blames me for my absence from the Board of Visitors of the Royal Observatory: he well knows the cause of that absence,—and the public will perhaps learn it with surprise. I may, however, remark, in passing, that it is not usual, in society, for the officer of a public institution to apply to its visitors, or to their writings, terms such as the following,—"malevolent essays,"—"utterance of calumnious insinuations, under Parliamentary authority,"—"ignorant calumniator." The necessity of consulting books and papers, induces me to request you will indulge me by inserting the answer which I propose sending you in your number of the following week.

J. South.

METROPOLITAN BRIDGES AND WESTMINSTER IMPROVEMENTS.

July 28.

Before the year 1739 no structure across the Thames existed, within the limits of the great cities of London and Westminster, except the old bridge between Southwark and Fish Street Hill: and this —which, being built on wide starlings, greatly obstructed the water-way—had till then sufficed for the conveyance of all the heavy goods that, coming from the south-eastern districts of the country, entered into or passed through London. Up to that time, the ferries supplied the place of bridges for such passengers as could not conveniently avail themselves of that which was situated near the eastern extremity of the city; and a numerous body of watermen were employed in transporting these across the river—or in conveying persons and goods from one part of the town to another.

At length, the increasing inconveniences arising from the want of sufficient means of communication, rendered the construction of a second bridge absolutely necessary; and, notwithstanding the opposition of persons whose means of living depended on the existing mode of supplying the markets of the metropolis by water carriage, as well as the national prejudice against foreigners, the bridge at Westminster was executed by a Swiss engineer.

At that time, no experiments had been made to ascertain the feasibility of laying dry the bed of the river at the spots where piers were to be built; and M. Labelye adopted an old practice of forming the piers in caissons, and causing them to sink at the places where they were to remain. It appears that no attempt was made to drive piles into the bed of the river for the support of the structure; and the consequence was that the bed soon began to yield under the enormous pressure. A sinking of the piers has been since continually taking place: and if it were not that, at great cost, means are constantly employed to prevent the bed from being washed from under them, the bridge must long since have fallen.

The bridges of Orleans and Neuilly were begun, the former three, and the latter about twenty years after the completion of Westminster Bridge: but the French engineers, probably aware of what had happened to the latter, wisely formed what are called coffer-dams; and, having caused the water to be pumped out, built their piers on the naked beds of the rivers. Their method was followed by Mr. Semple, in the construction of Essex Bridge, at Dublin,—and more recently by the Rennies—father and son—in building the magnificent bridges which adorn the British capital. It is evident that a practice by which an engineer is enabled to lay his foundations on the bed of a river with the same security as on dry land, should be henceforth followed in the construction of bridges; and an opportunity is now presented for its application by the existing necessity of building one between Westminster and Lambeth, in order to replace the present clumsy and distorted structure—which is a standing, or rather a sinking, reproach to the architectural talent of the country.

The subject has been opportunely taken up by an officer of high rank in the military service,—than whom no one is more capable of advocating measures by which public convenience and utility may be advanced—I mean Sir Howard Douglas. In a pamphlet just published the gallant officer, besides pointing out the scientific principles on which depends the stability of bridges, whether upheld by suspension or supported on arches, has, in forcible language, pointed out the necessity which exists for immediately making a safe and appropriate communication across the river, and the advantages which would result from the numerous improvements of which the western part of the metropolis is susceptible. Whether or not the entire removal of Westminster Bridge, and the formation of one in a more convenient situation, are consistent with a due regard to private interests, is, of course, open to inquiry; but if such considerations should render it necessary to build a bridge on the same spot as the present, it is imperative that the new structure should harmonize with the splendid edifice now in the course of being constructed at its northern extremity—of which it will then be an accessory; and that, by being kept sufficiently low, it should mask as little as possible the features of that edifice from the view of persons approaching by the southern side of the river.

It will, however, be a subject of lasting regret if the occasion which now presents itself of selecting a more advantageous spot for the new bridge be neglected:—and the attention of those with whom rests the decision on this important matter may be advantageously directed to the arguments advanced in the pamphlet in question in favour of a site which will lead immediately to the important and superb buildings, both public and private, that constitute the western part of this great metropolis,—while it will allow the northern side of the river to present unbroken one of the noblest displays of architectural magnificence in Europe.

ARCHÆOLOGICAL INSTITUTE OF GREAT BRITAIN AND IRELAND.

[*From our own Correspondent.*]

York, July 28.

Prof. Willis's Lecture on the Minster, and his Peripatetic Remarks made on the building itself, so completely engrossed the attention of the Institute on Wednesday, that the Historical and the Early and Mediæval Sections were obliged to postpone their meetings. Two papers of consequence were read, however, in the course of the evening;—one, by the Rev. C. H. Hartshorne, 'On the Parliaments at York,'—and the other 'On the Causes which arrested the Progress of Mediæval Sculpture,' by Mr. Richard Westmacott, A.R.A.

On the Parliaments at York.—"The earliest Parliament mentioned as being assembled in this city, is that held in the 26th year of Edward I. (1298). A writ, tested at Westminster, was issued to the Earl of Surrey, commander of the army in Scotland,—desiring him to bring with him such of the Barons in his service as he thought proper, to meet the King at York on the day of Pentecost, there to hold a special conference (*colloquium*) touching the affairs of the King and State,—leaving, in the meanwhile, their men at arms within the walls of Berwick-upon-Tweed, for its protection. On the same day, writs were issued to Roger le Bygod, Earl Marshal, and to the Earls of Gloucester, Hereford, Angus, and Arundel. The Sheriff of Yorkshire was, at the same time, directed to summon two Knights of the Shire and two discreet and able citizens, so that each party should have full and sufficient authority to express their feelings in the Common Council; lest, through want of this confidence, the business they had to transact should remain in any way imperfect. Writs of a similar tenor were addressed from Fulham to the other sheriffs, and it appears, from the records, that 70 [illegible] were returned, on this occasion, by the counties, and 154 by the boroughs, or, according to modern phraseology, 224 representatives of the Commons and 6 Peers. In this assembly there are two things very remarkable;—viz. the entire absence of the ecclesiastics and the overwhelming majority of the Commons. With a few exceptions, all the original writs exist; but no enrolment of this [illegible] of expenses has been preserved, excepting 16*s.* each for the citizens from London. There is very presumptive proof of this being a freely chosen and independent body of constituents.—The Scottish nobility were summoned to this Parliament—the King insinuating that, if they did not appear, they would be considered enemies of the State. As such their absence declared them; and, sending no excuses, Edward adopted measures for their chastisement. Considering the posture of affairs in Scotland at this juncture, it is more than probable that the King's chief object in calling together this Parliament was to obtain an aid for carrying on the war. The Exchequer and the Bench were transferred hither on this occasion; and to the frequent removal of the former, much of the loss and confusion in its documents may be attributed,—a circumstance that will also explain the meagre account that has been handed down of the transactions of the first Parliament assembled in York. The Rolls of Parliament have not preserved any particulars of the business that passed under review; for the settlement of the dowries of Margaret of Navarre (afterwards united to Edward I.), and of Isabella (espoused to his son), have been incorrectly placed in the printed copies under this year of his reign. Contemporary historians have only slightly supplied the deficiency of more accredited records. We learn from these, however, that the Earls of Hereford and Norfolk, two of the discontented Barons, who regarded the exercise of the royal prerogative with peculiar suspicion, did not omit the present opportunity of demanding a confirmation of the Charters already obtained from Henry III. These Charters were, in all respects, very important safeguards of public freedom. The one, always deemed the Great Charter of the Liberties of the Kingdom, loosened the bonds of feudal tyranny; and the other, the Charter of the Forest, mitigated the extreme severity of the Game Laws. * * After the 9th of Edward III. (1335), no Parliaments of constitutional importance were assembled in York. Those summoned the 16th Richard II. (1392), and the 2nd of Henry IV. (1400), never met; whilst that of the 10th of Edward IV. was superseded. The last Parliament (if I may so call it) in any shape assembled at York, was the Council of Peers called by Charles I.; and which met in the Hall of the Deanery, on the 24th of September, 1640,—a few weeks before the formation of the celebrated Long Parliament of English history."

Of Mr. Westmacott's paper we purpose also furnishing our readers with an abstract; but with the view of completing our account of the doings of the Meeting in our present number, we reserve it for next week's publication.

The Historical Section met, at 11 on Thursday, in the Hospitium of St. Mary's Abbey. Several papers were read—one by Mr. Stapleton—three by the Rev. Joseph Hunter—and one by Mr. Hailstone, the Local Secretary. Mr. Stapleton's paper consisted of a series of historical details 'On the Endowment and History of the Holy Trinity or Christ Church, at York,'—a priory of Benedictine monks, subject to the Abbey of Marmoutier, near Tours, in France—called from its wealth and pre-eminence the Majus Monasterium, whence our modern Marmoutier. Mr. Stapleton entered at great length, and with his accustomed research, into the history of Ralph Paynell, the founder, the lands belonging to the Priory, and the several entries on the Rolls which bear upon its history.—Mr. Hunter's first paper consisted of a series of 'Notes of MSS. from the Wills in the Register at York.' Some of these entries are very interesting. Thomas de Farnylaw, who was Chancellor of the Church of York in 1378, leaves a Bible and Concordance to be placed in the north porch of the Church of St. Nicholas at Newcastle, "there to be chained for common use, for the

ver, and refreshed themselves and the cattle, and llowed it down to the coast. They were now on ie shores of Limmen Bight. In this vicinity exten- ve salt basins were discovered; with a great store of perior salt naturally formed,—they say many ship ads. Here the Doctor made an attempt to travel estward; and having reached the table land, which, this spot, appears to approach nearer to the sea, e party boldly shaped a course for Port Essington. hey suffered more here than in all their former xperience. No water, no descending again;—they assed along the verge of stupendous cliffs, with a ost delightful-looking country below them. At ength, in great exhaustion, they opportunely reached ie dip towards the Alligators,—having been neces- arily thrown out of their direct route; but now they ere fully compensated. The Doctor says the coun- y at the head of, and along, the Alligators, sur- assed in fertility and beauty everything they had een. They were rather perplexed with the difficulty of rossing the streams; but at length approached the eninsula,—men and cattle greatly reduced in powers. —It was evident the cattle could only travel a few more ays. Soon after, a native offered to conduct them o the settlement. They had swerved from the proper oute; and would have arrived far up to the north- ard, on the opposite side of the port, but for this uide."

The papers of the week announce the death of ne of those remarkable men who must not be suf- ered to pass away without a word of tribute from the *Athenæum*. It is not because he was a Brahmin of he highest caste, that the Baboo Dwarkanauth Ta- ore claims a record in our columns,—but because of he intelligence that broke through the trammels of eremonial by which his countrymen had been so ong fettered, and the munificence that wrote his ame on every project which had their happiness and melioration for its purpose. The Hindoo College, he Hospital, and the School of Anatomy, at Calcutta, re all standing memorials of the Baboo's zeal and iberality in the causes of charity and improvement; while our readers will not have forgotten his munifi- ent donation of 10,000*l.* to the District Charitable Fund. The successive rulers of our Indian empire ad the benefit of his co-operation in every measure which proposed to stir the stagnant superstition of he East: while, irresistibly attached himself towards he source and centre of that light which was spread- ng over his country, he came to Europe in search of he friendships which his great character had earned —and found there, like his distinguished compatriot, Rammohun Roy, a foreign grave.

We are happy to learn that the storm of Saturday ast caused no worse results to the Public Records in Carlton Ride than that of disturbing their arrange- ment. Had it occurred in the night, the mischief might have been very serious. It may happen that he accident will have its use in directing the atten- tion of the Government to the necessity of instantly providing a repository which shall defy not only fire, but water also.

The annual meeting of the British Archæologi- al Association has been holden during the present week, at Gloucester. The sittings commenced on Monday last,—Mr. Pettigrew acting as President; and that gentleman read a Report of the Society's operations during the past year.—A paper was read by Mr. Inskep, containing some interesting particu- lars in connexion with the discovery of "Roman tesselated pavement in the cellar of an inn, called 'The Oxbody';" and one, by Mr. Duke, entitled, 'An Account of a Baronial Mansion at Pluish, in Shropshire.'—In the evening, a series of papers were read connected with the history and antiqui- ties of Gloucester. The first was by Mr. Britton, 'On the New Inn and Ancient Post-house.' The others were,—'On Monkish Miracles, as illustrative of History,' by Mr. Wright; 'Enamel on a Box,' communicated by Mr. Pritty, of Northampton; and 'On the Etymology of Gloucester,' by Mr. Puttock. On Tuesday, the chair was taken by Richard Monck- ton Milnes, Esq.; and the proceedings commenced with a paper, 'On Gloucester Cathedral,' by Edward Cresy, Esq.:—after which, the tomb of Bishop Hooper and the Church of St. Mary were visited. The latter specimen of the architecture of the Middle Ages has recently undergone a complete renovation; and, in the progress of the repairs, several remains interest- ing to archæologists were found. In the evening, 'Some Remarks on Gloucester Cathedral' were read, by Mr. Repton; and Mr. Godwin entreated the authorities to look to the Cathedral, and take means to prevent its decay.—A paper was read, entitled, 'The Gloucester Peg Tankard.' The workmanship of this drinking cup is very fine; bearing three or four distinct allegories, representing the seasons, the seven deadly sins, &c., elaborately carved on the out- side. An act was passed for the purpose of abating drunkenness; and it was ordained that all drinking- cups at taverns should have pegs placed at stated distances,—beyond which peg no man should drink at one draught, under pain of severe punishment. It was suggested that the well-known sayings, "taken down a peg," "a peg too low," and "he is getting on, peg by peg," might have taken their rise from these cups. The reading of a paper 'On the Writ- ings of Robert of Gloucester,' concluded the business of the evening. On Wednesday, the congress pro- ceeded to Cirencester and Woodchester, to inspect Roman remains, and other objects of interest.

Mr. Melville's clever work on the Marquesas, which excited so much interest,—and certainly not less sus- picion, on its first publication,—has received a some- what unexpected testimony to its authenticity, the value of which every reader must decide for himself. 'Toby,' the timorous Toby, has suddenly made his appearance; and addressed the following letter to the editor of the *Buffalo Commercial Advertiser* [U.S.]— Toby, says the editor, "is now living in this city, follow- ing the business of a house and sign painter. His father is a respectable farmer in the town of Darien, Genesee county. We received from *Toby* this morn- ing the subjoined communication. His verbal state- ments correspond, in all essential particulars, with those made by Mr. Melville respecting their joint adventures; and, from the assurances we have received in regard to Toby's character, we have no reason to doubt his word. His turning up here is a strange verification of a very strange and, as has hitherto been deemed, an almost incredible book."—

"In the *New York Evangelist* I chanced to see a notice of a new publication in two parts, called '*Typee, a Residence in the Marquesas*,' by Herman Melville. In the book he speaks of his comrade in misfortune, 'Toby,' who left him so mysteriously, and whom he supposed had been killed by the Happar natives. The *Evangelist* speaks rather disparag- ingly of the book as being too romantic to be true, and as being too severe on the missionaries. But to my object:—I am the true and veritable 'Toby,' yet living; and I am happy to testify to the entire accuracy of the work, so long as I was with Melville, who makes me figure so largely in it. I have not heard of Melville, or 'Tommo,' since I left him on the island, and likewise supposed him to be dead: and, not knowing where a letter would find him, and being anxious to know where he is and tell him my 'yarn' and compare 'log books,' I have concluded to ask you to insert this notice, and inform him of my yet being alive, and to ask you to request New York, Albany and Boston papers to publish this notice, so that it may reach him. My true name is Richard Green; and I have the scar on my head which I received from the Happar spear, and which came near killing me. I left Melville and fell in with an Irishman, who had resided on the island for some time, and who assisted me in returning to ship, and who faithfully promised me to go and bring Melville to our ship next day, which he never did, his only object being money. I gave him five dollars to get me on board, but could not return to Melville. I sailed to New Zealand, and thence home: and I request Melville to send me his address, if this should chance to meet his eye. *Mortarkee* was the word I used when I heard of his being alive. TOBY."

The *Times* states that an expedition, which pro- mises the most important results both to science and commerce, is at this moment fitting out for the pur- pose of navigating some of the great unexplored rivers in South America. It is to be under the command of Lord Ranelagh: and several noblemen and gentlemen have already volunteered to accom- pany his Lordship. The enterprising and scientific band, it is said, will sail as soon as the necessary arrangements shall be completed.

The Paris papers mention the sudden death, at the premature age of forty-six, of M. Théodore Fix, a very voluminous writer on political economy.

We have received from Sir James South the letter, professing to be an answer to Mr. Airy, for whose insertion we gave, last week, a conditional promise. The communication in question strongly illustrates the necessity, which we have long since recognized, of making all such pledges conditional. As two- thirds of this letter relate to other questions than those raised by the Astronomer-Royal,—and as other names, not properly involved in the issues, are dragged by Sir James South into the controversy, we have felt bound to decline publishing it in its present form. All that portion of Sir James's letter which replies to Mr. Airy we have, of course, repeated our willingness to insert.

DIORAMA, REGENT'S PARK.—REDUCED PRICE of AD- MITTANCE.—Now OPEN, with a highly interesting exhibition, representing the CASTLE and TOWN of HEIDELBERG (formerly the residence of the Electors Palatine of the Rhine) under the various aspects of Winter and Summer, Mid-day and Evening; and the exterior view of the CATHEDRAL of NOTRE DAME at Paris, as seen at Sunset and by Moonlight, and which has been so uni- versally admired. Both pictures are painted by the late Chevalier Renoux. Open from 10 till 6. Admittance to view both Pictures —Saloon, 1*s.*; Stalls, 2*s.* as heretofore.

ROYAL POLYTECHNIC INSTITUTION.—A CHEMICAL LECTURE, by Dr. RYAN, daily, and on the Evenings of Mondays, Wednesdays, and Fridays. Prof. BACHHOFFNER'S LECTURES on NATURAL PHILOSOPHY, with brilliant experiments, daily. MACINTOSH'S REVOLVING ENGINE, COLEMAN'S PA- TENT LOCOMOTIVE ENGINE for ascending and descending Inclined Planes. FARRELL'S ARCHIMEDEAN RAILWAY, the ATMOSPHERIC RAILWAY, all in action. HALLETT'S ATMOSPHERIC RAILWAY VALVE. CLARK, M'NEILL & CO.'S PATENT UNIVERSAL GAS-BURNER. The OPAQUE MICROSCOPE. The OXY-HYDROGEN MICROSCOPE, ex- hibiting a fine collection of Living Objects. A beautiful Picture of the CHAPEL in the CONVENT of St. CATHERINE, near JERU- SALEM, by Mr. Charles Smith, is one of the Series of DISSOLVING VIEWS.—Admission, 1*s.*; Schools, Half-price.

BOTANICAL SOCIETY.—*June 5.*—E. Doubleday, Esq. V.P. F.L.S. in the chair. Dr. Dewar presented a specimen of *Luzula nivea*, discovered near Broom- hall, Fifeshire. Dr. Dewar considers this plant un- doubtedly wild in that locality. The following speci- mens were exhibited:—Specimens of *Ranunculus aquatilis*, approaching very near to *Ranunculus Le- normandi*, but differing by their more completely tripartite leaves, and the more lateral position of the style on the grown fruit: sent by Mr. Hewett Watson, from Esher Common, Surrey.—Specimens of a *Filago*, which would be referred to *Filago germanica* by English botanists, but which is thought likely to prove a distinct species by its discoverer, the Rev. G. E. Smith; who communicated a descriptive account of the plant, along with the specimens for the Society's Herbarium.

MEETING FOR THE ENSUING WEEK.

TUES. Zoological Society, half-past 8.—Scientific Business.

FINE ARTS

FIFTH REPORT OF THE SCHOOL OF DESIGN.

A fortnight ago, the eloquent remarks of Lord Morpeth attracted our attention to the increased and growing interest elicited by the establishment of Schools of Design throughout the country; and we expressed an intention of recurring to the subject on the appearance of the Annual Report to Parlia- ment from the Institution at Somerset House. Of that document we have now obtained a copy; and a more meagre, dry, uninteresting detail of twelve months' proceedings at a great public establish- ment it has not often been our office to criticize. Who may be the real author of these pages does not, of course, reveal itself. The highly respected names officially appended would give the Re- port a claim to be considered as the direct off- spring of the Council; but the writing is so loose, the statements are so prosaically rendered, the few commendations are so freezingly bestowed, the spe- culations for the future are so barren, that it is diffi- cult to suppose its authorship to be that of men whose names are distinguished by literary, political, and artistic eminence. How significant a commentary is it on the remarks called forth from us on the occasion above alluded to! This Report, indeed, presents a striking contrast to those admirable Art-reviews, the *Reports on the Royal Commission on the Fine Arts*. Would that we could have exclaimed, "Non facies omnibus una, sed qualis decet esse sororum!" Alas! there is not even a family likeness. In the commis- sion-papers not only do we find the careful selection of every incident at all deserving a passing mention; but the occasion is eagerly seized by the hand of genius to pour out, for the edification of the Parliament and people, the most lucid and masterly essays. The hammer is wisely impelled while the iron is hot. The statistical inquiries and statements of the moment are appropriately illustrated by cognate literary and artistic inquiries; and the reader who sat down to see what the Commission have been doing, rises refreshed with solid views. He who had dreamed only of the propriety of examining an official summary has found himself seduced into considering the general claims and charms of Art. There may be no EAST- LAKE at the School of Design; yet the example

might have furnished, one would think, some hint towards an attempt in a similar direction;—and what more pregnant theme could be desired by a mind of energy, resolution, fancy, and forethought than that offered by the scope, means, and requirements of *Industrial Art?* When legislators are called upon to vote supplies, a little largess of eloquence on the right side, supported by the due admixture of dry facts, is not, we believe, viewed in an offensive light. Where, on the contrary, the suggestive spirit is wanting, the patron sentiment is apt to descend to the level of the applicant's enthusiasm; and what would have been liberally bestowed upon large-minded speculations gives way to a sparing concession of the barely necessary. What we should like to have seen pointed out is, the important difference between a mere national drawing-school and those nobler institutions which seek to spread among great masses of our population the varied, interesting, and refining studies whence the operative-student is to draw his stock of pure delight, gain his means of livelihood, and add to the treasures and character of his country. But the favourable opportunity which the unstinted supply of official pages presents, for stirring up readers to increased energy in forwarding the great experiment which Government has instituted, is suffered to pass away. No enthusiastic pen traces out the brilliant path that lies before the earnest and successful student of these branches of Art—a path studded with all the graceful pleasures, while unclogged by the thorns, that beset the devotee of the highest walks; neither is the legislator led to dwell on the important bearing which his labours may have upon the industrial efforts, and consequent wealth of his nation. The recent great changes in the political world—the freedom of trade, and the repeal of the duty on glass—bear strongly on the necessities of Schools of Design. In a few words on the Newcastle School, the latter of these subjects is glanced at; but the former, suggesting, as it does, the paramount urgency of competing with foreign nations in *design*, was, we presume, too ticklish a subject to tempt a daring flight. Yet surely, these are truths requiring enunciation,—demanding frequent utterance; and, knowing the talent which does exist at Somerset House, we marvel at that poverty of the Report which we can ascribe only to lack of search or confinement of range.

These are a few salient suggestions on the first perusal of the Report,—which has just come into our hands. The details of proceedings, derived from a general analysis, with any comments which these may deserve, shall obtain our early attention; which will be the more appropriately bestowed when aided by an inspection of the exhibition that will shortly terminate the session of 1845-6. In the meantime, let us guard ourselves from any suspicion of hostility to the institution. It has our warmest wishes; but these make us desirous to find a sagacious view taken of the means of making the best use of existing materials and space,—and an energetic prompting of the Government towards that increased assistance which alone can thoroughly insure the progress of *Industrial Art* towards perfection.

PRIVATE EXHIBITIONS.

Morrison's Ducal Palaces of Saxe Coburg and Gotha.—During the past week, there have been exhibited at Mr. Hogarth's Gallery, in the Haymarket, the sketches made by Mr. Douglas Morrison for his work on the palaces of the Duke of Saxe Coburg and Gotha. Considered as mere sketches of scenery, these drawings are entitled to considerable praise; and they would, if the figures had been wholly left out, have pleased us better. The artist has considerable taste—the eye of a "Parkomaniac," as Prince Pückler called his park-founding compatriots—and an easy dashing style. It is a pity, therefore, that his performances should be disfigured by supposed doings in the ducal garden of which he was not an eye-witness; for instance, a gentleman boating, in the uniform of a British field-marshal. Again, the artist could place in the giant's hall of Ehrenburg—a colossal room, in disputable taste—nothing better than a couple of lacqueys!

Apart from the interest which attaches to the family mansion of the race whence our future sovereigns will have sprung, these drawings are, however, worthy of attention. Thus, the modern palatial style of Ehrenburg forms a striking and instructive contrast with Wachsenburg, the robber-fortress of the Counts of the Gleichen,—now a state prison; and both point the spiritless artificiality of Rosenau, a recent erection which has not a particle of originality to redeem it. If these sketches when published, as they shortly will be, should induce our architects to study the castles of the German sovereigns as specimens of architecture and construction, they will have done some service. To some of the forms disclosed by them, English scenery is quite a stranger; and though little is to be gained by mere imitation, much may be achieved by him who can seize on the spirit of that which is new. The influence of the Byzantines on the cathedral architecture—and so, mediately, on all the historic buildings—of Germany, is a subject that might be advantageously inquired into. To that influence this country was never subject.

Fine Art Gossip.—We have heard very favourable reports of the Fresco painted by Mr. Dyce in the House of Lords. It is said that the members of the Royal Commission of the Fine Arts, who "inspected" it, as the phrase is, on Tuesday, were greatly pleased with the result. A scaffolding was carefully prepared, at a due distance from the mural picture, in order that the distinguished party might have every facility for judging correctly of the effect. A renewed impetus will be given by this to the efforts for establishing a school of fresco painters amongst us.

We learn that Mr. Murdoch, Mr. Sintzenich, and Mr. Nursey, are the Masters appointed, respectively, to the Schools of Design, in the Potteries, at Paisley, and at Leeds.

A portrait-statue of Sir Fowell Buxton, to be erected in Westminster Abbey, has been the source of a competition between Messrs. Thrupp, Weekes, Marshall, Watson, and Joseph, the sculptors. The former has been the successful candidate for the honour;—and the price is to be 1,000*l.* Mr. Baily and Mr. Bell, we understand, declined to compete.

The subject selected by the stewards as a prize for the approaching races at Doncaster is a group, in silver, representing Sir Clifford Constable overturning the Duke of York, at the Battle of Wakefield.

A communication from Prof. Schottlauer, of Munich, acquaints us with particulars of a new invention for painting upon walls, discovered by himself conjointly with Herr Fuchs, Counsellor of the Mines—to be called Stereochromy. Its peculiarities are stated as follows:—Far greater ease in its manipulation than fresco. The ground is not laid in patches, but by one single operation. The colours—prepared in distilled rain water,—take such firm hold as not to be disturbed or altered by any subsequent washings or shades; while the process of painting may be carried on with any amount of intervals—thus rendering a far richer finish possible than with fresco.—After the picture is finished, it is saturated with a fluid, which unites the ground and the colours into a mass of the consistency of stone; dessications being thereby rendered impossible.—The colours are of greater strength and brightness than with fresco,—though without the slightest glare or reflection as of oil.—It resists all atmospheric influences,—humidity, evaporation, &c.: a test no less extreme than the burning of alcohol has been applied to it, without the slightest change or deterioration.

We find it stated, from Constantinople, that a monument has been discovered in a vineyard at Halki,—one of the delightful islands of the Propontis frequented by summer emigrants from the capital—which is peculiarly interesting to an Englishman. It is dedicated to the memory of Barton, the English ambassador to the court of Turkey in Elizabeth's reign. Sir Stratford Canning has given 50*l.* for its restoration.

From Paris, we learn that the Arts have sustained another loss in that one of their departments which has been heavily visited of late—by the death of M. Barthélemy Vignon, the architect, at the advanced age of eighty-five. M. Vignon had been architect to the Empress Josephine, at Malmaison,—to Louis Bonaparte, when King of Holland,—and to Murat, King of Naples, in succession.—The Emperor of Austria has conferred on M. Pernot, the painter, his large gold medal of Letters and the Arts,—in reward for the tomb which, as a member of Committee of Arts and Monuments, the latter had the task of erecting, at Joinville, over remains of seventeen princes of the House of raine—from which the Emperor is descended.

From Genoa, we hear that the marble monu to the memory of Christopher Columbus, dest by the Sardinian Government for that city, is finis and about to be immediately erected. Its inaug tion will take place next month, during the cong of naturalists in Genoa;—and the King and family will be present at the solemnity.

MUSIC AND THE DRAMA

QUEEN'S THEATRE, TOTTENHAM-STREET, WILL O for a Second Season, under the Management of Mr. ABING On MONDAY, August 10th, when will be performed the F 'THE STRANGER.' The *Stranger*, by Mr. Abington; *Mrs. A* Mrs. R. Gordon. After which, Charles Selby's successful Fa 'YOU MUST BE MARRIED,' *Millie, Vinaigrette*, Mrs. Selb conclude with 'THE HAPPIEST DAY OF LIFE,' *Mr. G.* Mr. P. Emery; *Mrs. Dudley*, Mrs. Selby.

Drury Lane.—M. Couderc's recovery fro long and obstinate hoarseness enabled the Be Company, on Monday last, to produce M. Hal 'Mousquetaires de la Reine;' which, as every knows, has "won *the* crown" this year at the *Comique* of Paris,—having been played there ei nights. In fact, it has brought M. Halévy his success, in the capacity of a gay composer; 'L'Éclair'—though full of ingenuity, and al unique as a work made up of only four charac without a chorus,—is spoken well of, but heard: while 'Le Guitarrero,' 'Le Drapier,' Lazzarone,' and other works, have shared the fa the three serious operas which succeeded 'La Ju —been forced forward, that is, with every pos determination to make them popular; but, in spi all efforts, they have failed to please. Indeed, ha M. Halévy been strong in his position, from cause dependent of his musical reputation, it would been impossible for him to have gained such quent hearings on warrant so slender.—The Par success of 'Les Mousquetaires' has been so dec that we do not know whether our curiosity or surprise has been the greater, on, at last, makin acquaintance. The former was pleasantly grat by the story, which, if not new, is piquant: the on which a French composer might naturally lik work. There are a sentimental Maid of Hono Anne of Austria, the delicate *Athenaïs de Sol* (Madame Laborde), and a sprightly one, *Berth Simiane* (Madame Guichard);—and there are a s mental *Mousquetaire*, *Olivier d'Entragues* (M. dere), and a spirited comrade, *Hector de Biron* Boulo). Add to these an elder *Mousquetaire, le C taine Roland* (M. Zelger); and, by thus naming characters, the cast of adventure and intrigue been half suggested. Some of *Hector's* bold wo gets laid to the door of the gentler *Olivier*. The la too, is miscredited with a duel; and, to save from the heavy punishment instituted for all gallantries by Richelieu, *Athenaïs*, proceedin a mistake, perils her honour by declaring lover to have been with her at the very cri moment—thus opening his innocent mind to perate suspicions, since the intruder on her pri was another—not himself! Fancy all these dilem set in a frame-work of courtly incidents—la vouchsafing scarfs to their cavaliers—revels in m at court, terrace-scenes, &c.—fancy costumes becoming as brilliant, and a very fair execu and we have a play filled, as we have said the agreeable gratification of our curiosity. N as regards our surprise: this was not excited finding M. Halévy's music what it has alt been, as we said last week, "dry"—but by the that a work in every respect so referable to parentage should have run fourscore nights in P First impressions may be trusted with regard t that concerns *stage effect*. The critic must e into scientific combinations, by "painful steps slow"—do justice to clever instrumentation, and that is meant by "good writing," &c. on se and third hearings;—but unless an opera seizes at once, by dramatic fitness or fascinating mel it is no opera worth having. We do not admit favourite French epithet of "distinguished," in ex for phrases not commonplace, only because a queer unexpected note is thrust in. Perfectly

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